

NEET / IIT-JEE

Practice Bank

Part - 1

Compiler

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About The Compiler

Sudhir Nama is an Accomplished Author With A Background Of Chemistry. Holding A Master's Degree in Chemistry, With A specialization in Organic Chemistry From IISER And Mechanism In Organic Chemistry From IITB. He Has A Deep Understanding Of The Subject. He Is An Experienced Chemistry Teacher With Over 10 Years Of Dedicated Teaching Experience. His Teaching Methods Focus On Creating A Supportive And Interactive Learning Environment, Where Students Are Encouraged To Ask Questions And Explore Their Curiosity.

With His Expertise And Enthusiasm, Sudhir Has Successfully Helped Numerous Students Excel In Their Chemistry Studies. Apart From This, He Is Also A Passionate Storyteller.

Publication

Textbook :

Organic Reaction And Mechanism (Organic Chemistry For 12th Board, NEET, JEE)

Book Availability : On Amazon, Flipkart, Google Book (Read For Free)

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1. GOC
2. Classification & Nomenclature, Stereochemistry
3. Chemical Bonding
4. Halo-Alkanes And Halo-Arenes
5. Oxygen Containing Compounds
(Alcohol, Phenol, Ether, Carboxylic Acid, Aldehyde & Ketone)
6. Nitrogen Containing Compounds

Note : The Examples And Questions In This Practice Bank Are Taken From Various Books, Institutions, Internet And Platforms

1. Chapter

General Organic Chemistry

Telegram @Chemistry_Spark

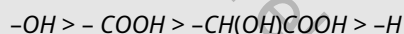
Tips & Tricks

✍ Wohler synthesised the first organic compound urea in the laboratory.

✍ The number of optical isomers of a compound depends on its structure and number of asymmetric carbon atoms present in its molecule.

✍ Stereoisomers that are not mirror images of each other are called diastereomers.

✍ Order of priority for both asymmetric carbon atoms using sequence rules is



✍ The nitration and sulphonation of alkanes involve free radicals.

✍ Carbenes undergo insertion reactions.

✍ Alkanes usually undergo free radical substitution when hydrogen is replaced by a halogen. It is catalysed by benzoyl peroxide (C_6H_5COO)₂.

✍ The polymerisation of alkenes is free radical addition reaction.

✍ Allyl free radical ($CH_2 = \dot{C}H - CH_2$) is more stable than *n*-propyl free radical ($CH_3CH_2\dot{C}H_2$).

✍ The stability of free radicals is explained on the basis of hyperconjugation or conjugation.

✍ Propene is more reactive than ethene towards electrophilic addition reaction due to the formation of more stable 2° carbocation.

✍ The reactivity of alkyl halides in SN^1 is $3^\circ > 2^\circ > 1^\circ > \text{methyl}$ while SN^2 is $\text{methyl} > 1^\circ > 2^\circ > 3^\circ$.

✍ Polar solvents favour SN^1 while non polar solvents favour SN^2 reactions.

✍ Dipole moment of $CHCl_3$ is less than that of CH_2Cl_2 . This is because in CH_2Cl_2 all bond moments reinforce each other while in $CHCl_3$ the bond moment of one of the Cl opposes the net moment of the other two.

✍ Low concentration of nucleophiles favour SN^1 while high concentration favour SN^2 .

✍ In SN^1 the attack of the nucleophile may be from either side and so racemization takes place. However, in SN^2 the attack of the nucleophile takes place from back side. So it leads to inversion of configuration.

✍ Hunsdieker reaction proceeds via free radical mechanism.

✍ Propene reacts with chlorine at 673 K to form allyl chloride and the intermediate is allyl free radical.

Ordinary Thinking

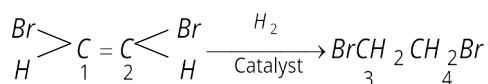
Objective Questions

Bonding and hybridisation in organic compounds

- In methane molecule, the hydrogen atoms around carbon are arranged as [DPMT 1980; MNR 1981; MP PET 1997, 99]
 - Square planar
 - Tetrahedral
 - Triangular
 - Octahedral
- In carbon tetrachloride, four valence of carbon are directed to four corners of [CPMT 1973, 77]
 - Rectangle
 - Square
 - Tetrahedron
 - None of these
- In alkene (ethene) number of sp^2 hybrid carbon atoms are
 - 1
 - 2
 - 3
 - 0
- Each carbon atom in benzene is in the state of hybridization [CPMT 1973, 83, 89; MP PMT 1993; KCET (Med.) 1999; DCE 2001]
 - sp^3
 - sp^2
 - sp
 - s^3p
- Which of the following hybridisation has highest percentage of s-character [BHU 1986]
 - sp^3
 - sp^2
 - sp
 - None of these
- The hybridisation present in C_2H_2 is [EAMCET 1993]
 - sp
 - sp^2
 - sp^3
 - dsp^2
- What hybrid orbitals will form the following compound $H_3C - CH = CH - CH_2 - CH_3$ [AFMC 1991]
 - sp and sp^3
 - sp^2 and sp^3
 - sp and sp^2
 - Only sp^3
- The compound in which carbon uses only its sp^3 hybrid orbitals for bond formation is [IIT-JEE 1989]





- (a) HCOOH (b) $(\text{NH}_2)_2\text{CO}$
 (c) $(\text{CH}_3)_3\text{COH}$ (d) $(\text{CH}_3)_3\text{CHO}$
9. A straight chain hydrocarbon has the molecular formula C_8H_{10} . The hybridisation for the carbon atoms from one end of the chain to the other are respectively $sp^3, sp^2, sp^2, sp^3, sp^2, sp^2, sp$ and sp . The structural formula of the hydrocarbon would be [CBSE PMT 1992]
- (a) $\text{CH}_3 - \text{C} \equiv \text{C} - \text{CH}_2 - \text{CH} = \text{CH} - \text{CH} = \text{CH}_2$
 (b) $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH} - \text{CH}_2 - \text{C} \equiv \text{C} - \text{CH} = \text{CH}_2$
 (c) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_2 - \text{C} \equiv \text{C} - \text{CH} = \text{CH}_2$
 (d) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_2 - \text{CH} = \text{CH} - \text{C} \equiv \text{CH}$
10. Which of the following has a bond formed by overlap of $sp - sp^3$ hybrid orbitals [MNR 1993; UPSEAT 2001, 02]
- (a) $\text{CH}_3 - \text{C} \equiv \text{C} - \text{H}$
 (b) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_3$
 (c) $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$
 (d) $\text{HC} \equiv \text{CH}$
11. The bond between carbon atom (1) and carbon atom (2) in compound $\text{N} \equiv \text{C} - \text{CH} = \text{CH}_2$ involves the hybridised carbon as [IIT-JEE 1987; DCE 2000]
- (a) sp^2 and sp^2 (b) sp^3 and sp
 (c) sp and sp^2 (d) sp and sp
12. Number of π bonds in $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH} - \text{C} \equiv \text{CH}$ is [Kurukshetra CEE 1991; KCET 2000]
- (a) 2 (b) 3
 (c) 4 (d) 5
13. Number of π electrons present in naphthalene is [AFMC 1991]
- (a) 4 (b) 6
 (c) 10 (d) 14
14. Number of π electrons in cyclobutadienyl anion $(\text{C}_4\text{H}_4)^{-2}$ is [IIT-JEE 1991]
- (a) 2 (b) 4
 (c) 6 (d) 8
15. Homolytic fission of C - C bond in ethane gives an intermediate in which carbon is [IIT-JEE 1992]
- (a) sp^3 hybridised (b) sp^2 hybridised
 (c) sp hybridised (d) sp^2d hybridised

16. In the reaction



The hybridisation states of carbon atoms 1, 2, 3, 4 are

[MP PET 1994]

- (a) 1 and 2 sp^2 ; 3 and 4 sp^3
 (b) 1 and 2 sp^2 ; 3 and 4 sp
 (c) 1, 2, 3 and 4 sp
 (d) 1, 2 sp^3 ; 3, 4 sp^2
17. In which of the compounds given below is there more than one kind of hybridisation (sp, sp^2, sp^3) for carbon
- (i) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
 (ii) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_3$
 (iii) $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$
 (iv) $\text{H} - \text{C} \equiv \text{C} - \text{H}$ [CBSE PMT 1995]
- (a) (ii) and (iv) (b) (i) and (iv)
 (c) (ii) and (iii) (d) (ii)
18. Examine the following common chemical structures to which simple functional groups are often attached
- (i)  (ii) 
 (iii)  (iv) 
 (v) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2 -$
 (v) $\text{H}_2\text{C} = \text{C} < \begin{array}{c} \text{H} \\ \text{H} \end{array}$

Which of these systems have essentially planar geometry

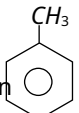
[CBSE PMT 1995]

- (a) (i) and (v) (b) (ii) and (iii)
 (c) (ii), (iii) and (iv) (d) (iv)
19. The structure of di-chloromethane is [MP PMT 1995]
- (a) Tetrahedral (b) Trigonal
 (c) Linear (d) Hexagonal
20. The numbers of sigma (σ) bonds in 1-butene is [MP PMT 1995]
- (a) 8 (b) 10
 (c) 11 (d) 12
21. Which of the following statements is false for isopentane

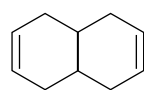



[MP PET 1996]

- (a) It has three CH_3 groups
 (b) It has one CH_2 group
 (c) It has one CH group
 (d) It has a carbon which is not bonded to hydrogen
22. The number of σ bonds in *o*-xylene is [MP PET 1996]
 (a) 6 (b) 9
 (c) 12 (d) 18
23. In benzene the total number of σ bonds is [MP PMT 1997]
 (a) 3 (b) 6
 (c) 9 (d) 12
24. The number of sp^3 hybridized carbon atoms in cyclohexene are [MP PMT 1997]
 (a) 2 (b) 3
 (c) 4 (d) 6
25. The number of π bonds in 3-hexyne-1-ene is [MP PMT 1999]
 (a) 1 (b) 2
 (c) 3 (d) 4
26. Example of sp^2 hybridization is [CPMT 1997]
 (a) CH_3^+ (b) CH_3
 (c) $C_2H_5^+$ (d) C_2H_5
27. Select the molecule which has only one π – bond [Pb. PMT 1998]
 (a) $CH \equiv CH$ (b) $CH_2 = CHCHO$
 (c) $CH_3CH = CH_2$ (d) $CH_3CH = CHCOOH$
28. Carbon atoms in the compound $(CN)_4C_2$ are [Roorkee 1999]
 (a) sp hybridized
 (b) sp^2 hybridized
 (c) sp and sp^2 hybridized
 (d) sp , sp^2 and sp^3 hybridized
29. Acetylene molecules contain [DCE 1999]
 (a) 5 σ bond
 (b) 4 σ bond and 1 π bond
 (c) 3 σ and 2 π
 (d) 3 σ and 3 π
30. Number of unhybridised orbitals in vinyl acetylene are [RPMT 1999]
 (a) 2 (b) 3
 (c) 4 (d) 6
31. Maximum bond energy of $C - H$ bonds is found in the compound [RPMT 1999]
 (a) Ethane (b) Ethene
 (c) Ethyne (d) Equal in all the three
32. Ethylene possess [RPET 1999]
 (a) Two sigma and two pi bonds
 (b) Two pi bonds
 (c) Five sigma and one pi bond
 (d) Four sigma and one pi bond
33. The hybridization involved in the six carbon atoms of benzene is [BHU 1999]
 (a) $3sp^3$, $3sp^2$ (b) $3sp^3$, $3sp$
 (c) All $6sp$ (d) All $6sp^2$
34. 1, 3-butadiene has [JIPMER 2000]
 (a) sp and sp^2 hybridised C-atoms
 (b) sp , sp^2 and sp^3 hybridized C-atoms
 (c) Only sp^2 hybridised C-atoms
 (d) Only sp hybridised C-atoms
35. Which of the following $C - H$ bond has the lowest bond dissociation energy [CBSE PMT 2000]
 (a) Primary (1°) $C - H$ bond
 (b) Secondary (2°) $C - H$ bond
 (c) Tertiary (3°) $C - H$ bond
 (d) All of these
36. Number of σ and π bonds present in 1-butene-3-yne respectively are [RPMT 1999; MP PET 2000; DCE 2000]
 (a) 7 σ , 3 π (b) 5 σ , 2 π
 (c) 8 σ , 3 π (d) 6 σ , 2 π
37. Which is an acidic hydrocarbon [AMU 2000]
 (a) $CH_3CH_2CH_2CH_3$ (b) $CH_3C \equiv CCH_3$
 (c) $CH_3C \equiv CH$ (d) $CH_2 = CH - CH = CH_2$
38. A carbon-carbon triple bond in ethyne ($-C \equiv C-$) consists of [AMU 2000]
 (a) All σ bonds
 (b) Two σ bonds and one π -bond
 (c) One σ bond and two π bonds
 (d) All π bonds
39. Toluene has [MP PMT 2000; Kerala CET 2005]
 (a) 6 σ and 3 π bond (b) 9 σ and 3 π bond
 (c) 9 σ and 6 π bond (d) 15 σ and 3 π bond

40. In compound X, all the bond angles are exactly $109^\circ 28'$, X is [DPMT 2000]
 (a) Chloroform (b) Carbon tetrachloride
 (c) Chloromethane (d) Iodoform
41. Which of the following hybridization is known as trigonal hybridization [MH CET 2000]
 (a) sp^3 (b) sp
 (c) sp^2 (d) dsp^2
42. The types of hybridization present in 1, 2-butadiene are [MH CET 2000]
 (a) sp, sp^2 and sp^3 (b) sp^2 and sp^3
 (c) sp^2 and sp (d) sp and sp^3
43. The C-H bond distance is longest in [BHU 2001]
 (a) C_2H_2 (b) C_2H_4
 (c) C_2H_6 (d) C_6H_6
44. Conjugated double bond is present in [RPMT 1999; JIPMER 2001]
 (a) 1, 2-butadiene (b) 1, 3-butadiene
 (c) 1, 3-pentadiene (d) β -butylene
45. In which of the following species is the underlined carbon having sp^3 hybridisation [AIEEE 2002]
 (a) $CH_3\text{C}\underline{OOH}$ (b) $CH_3\text{C}\underline{H}_2OH$
 (c) $CH_3\text{C}\underline{OCH}_3$ (d) $CH_2 = \underline{C}H - CH_3$
46. The $H - C - H$ bond angle in CH_4 is [MP PET 2002]
 (a) $109^\circ 28'$ (b) $107^\circ 28'$
 (c) 90° (d) 180°
47. The hybridisation of carbons of $C - C$ single bond of $HC \equiv C - CH = CH_2$ is [RPMT 2002]
 (a) $sp^3 - sp^3$ (b) $sp - sp^2$
 (c) $sp^3 - sp$ (d) $sp^2 - sp^3$
48. The shape of ethylene molecule is [AFMC 2002]
 (a) Square planar (b) Furan
 (c) Trigonal planar (d) Tetrahedral
49. Acetylene molecule has carbon in [Kerala (Engg.) 2002]
 (a) sp - hybridisation (b) sp^2 - hybridisation
 (c) sp^3 - hybridisation (d) sp^3d - hybridisation
50. In the formation of methane molecule, carbon makes use of [DPMT 2001; MP PMT 2002]
 (a) sp -hybridised orbitals (b) sp^2 -hybridised orbitals
 (c) sp^3 -hybridised orbitals (d) Unhybridised orbitals
51. In graphite C-atom is instate [CPMT 2002]
 (a) sp^3 (b) sp
 (c) sp^2 (d) None of these
52. How many π -bonds are present in naphthalene molecule [RPMT 2002]
 (a) 3 (b) 4
 (c) 5 (d) 6
53. Hybridisation state of C in diamond is [RPMT 2002]
 (a) sp (b) sp^2
 (c) sp^3 (d) sp^3d
54. The number of σ and π bonds present in pent-4-ene, 1-yne is [AIIMS 2002; CPMT 2002]
 (a) 10, 3 (b) 3, 10
 (c) 4, 9 (d) 9, 4
55. Which one of the following is more acidic [DPMT 2002]
 (a) Butane (b) 1-butene
 (c) 1-butyne (d) 2-butyne
56. Graphite is soft while diamond is hard because [BHU 2003]
 (a) Graphite is in powder form
 (b) Diamond has sp^2 hybridization but graphite has sp^3 hybridization
 (c) Graphite is in planar form while diamond is in tetrahedral form
 (d) Graphite is covalent and diamond is ionic
57. Hybridization of 1 and 2 carbon atoms in $CH_2 = \overset{1}{C} = \overset{2}{C}H_2$ [BHU 2003]
 (a) sp, sp (b) sp^2, sp^2
 (c) sp^2, sp (d) sp^3, sp^2
58. Hydrogen bonding is maximum in [UPSEAT 2003]
 (a) C_2H_5OH (b) $CH_3 - O - CH_3$
 (c) $(CH_3)_2C = O$ (d) CH_3CHO
59. How many methyl group are present in 2, 5-dimethyl-4-ethylheptane [EAMCET 2003]
 (a) 2 (b) 3
 (c) 4 (d) 5
60. Which one of the following does not have sp^2 hybridised carbon [AIEEE 2004]
 (a) Acetonitrile (b) Acetic acid
 (c) Acetone (d) Acetamide
61. Allyl cyanide contain σ - and π -bonds [MP PET 2004]
 (a) $9\sigma, 3\pi$ (b) $9\sigma, 9\pi$

- (c) $3\sigma, 4\pi$ (d) $5\sigma, 7\pi$
62. Strongest acid is [MP PMT 2004]
 (a) $HC \equiv CH$ (b) C_2H_6
 (c) C_6H_6 (d) CH_3OH
63. $-C \equiv C-$ bond is found in [BHU 1982; MP PMT 1994]
 (a) Ethene (b) Butene
 (c) Ethyne (d) Glycerine
64. Number of σ bonds in  [CPMT 1994]
 (a) 6 (b) 15
 (c) 10 (d) 12
65. Number of bonds in benzene [DPMT 2005]
 (a) 6σ and 3π (b) 12σ and 3π
 (c) 3π and 12π (d) 6σ and 6π
66. Which is most acidic of the following [J & K 2005]
 (a) Methane (b) Acetylene
 (c) 1-butene (d) Neo-pentane
67. The enolic form of acetone contains [Pb. PMT 2002]
 (a) 8σ bonds, 2π -bonds and 1 lone pairs
 (b) 9σ -bonds, 1π -bond and 2 lone pairs
 (c) 9σ -bonds, 2π -bonds and 1 lone pairs
 (d) 10σ -bonds, 1π -bonds and 1 lone pairs

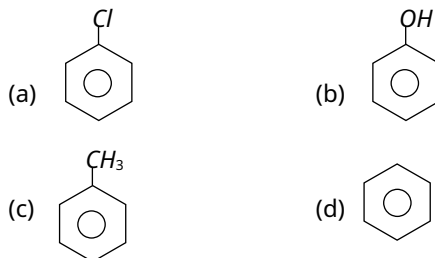
Dipole moment, resonance and reaction intermediates

1. Which has zero dipole moment [NCERT 1990; BHU 2001]
 (a) *cis*-2-butene (b) *trans*-2-butene
 (c) 1-butene (d) 2-methyl-1-propene
2. Dipole moment is shown by [DCE 1999]
 (a) 1, 4-dichloro benzene
 (b) *Cis*-1, 2-dichloro ethane
 (c) *Trans*-1, 2-dichloro, 2-pentene
 (d) *Trans*-1, 2-dichloro ether
3. Which compound shows dipole moment [RPMT 2002]
 (a) 1,4-di-chloro benzene
 (b) 1, 2-di-chloro benzene
 (c) *Trans*-1, 2-di-chloro ethene
 (d) *Trans*-2-butene
4. Which of the following is a polar compound [MH CET 2003]
 (a) C_2H_6 (b) CCl_4
 (c) HCl (d) CH_4
5. The dipole moment is the highest for [AIIMS 2004]
 (a) *Trans*-2-butene (b) 1, 3-Dimethylbenzene
 (c) Acetophenone (d) Ethanol
6. Resonance structure of molecule does not have [IIT-JEE 1984]
 (a) Identical arrangement of atoms
 (b) Nearly the same energy content
 (c) The same number of paired electrons
 (d) Identical bonding
7. All bonds in benzene are equal due to [Roorkee 1990; KCET 1998]
 (a) Tautomerism (b) Inductive effect
 (c) Resonance (d) Isomerism
8. Aromatic properties of benzene are proved by [MP PMT 1994]
 (a) Aromatic sextet theory (b) Resonance theory
 (c) Molecular orbital theory (d) All of these
9. Which of the following will show aromatic behaviour [KCET 1996]
- (a)  (b) 
- (c)  (d) 
10. Which one of the following orders is correct regarding the inductive effect of the substituents [CBSE PMT 1998]
 (a) $-NR_2 < -OR > -F$ (b) $-NR_2 > -OR > -F$
 (c) $-NR_2 < -OR < -F$ (d) $-NR_2 > -OR < -F$
11. Benzene is unreactive because [KCET 1998]
 (a) It has double bonds
 (b) It has carbon-carbon single bond
 (c) Carbon are sp^2 hybridised
 (d) π electrons are delocalised
12. Carboxylic acids are easily ionised. The main reason of this statement [UPSEAT 1999]
 (a) Absence of α -hydrogen
 (b) Resonance stabilisation of carboxylate ion
 (c) Reactivity of α -hydrogen
 (d) Hydrogen bond
13. 'C - C' bond length in benzene lies between single and double bond. The reason is [RPET 1999]
 (a) Resonance (b) Isomerism
 (c) Metamerism (d) Inductive effect
14. Credit for the ring structure of benzene goes to [RPET 1999]
 (a) Wholer (b) Faraday
 (c) Kekule (d) Baeyer
15. Polarisation of electrons in acrolein may be written as [DCE 2000]

- (a) $CH_2^{\delta-} = CH - CH^{\delta+} = O$
 (b) $CH_2^{\delta-} = CH - CH = O^{\delta+}$
 (c) $CH_2^{\delta-} = CH^{\delta+} - CH = O$
 (d) $CH_2^{\delta+} = CH - CH = O^{\delta-}$
16. In the mixture of conc. H_2SO_4 and HNO_3 the nitrating species is [MP PMT 2000]
 (a) N_2O_4 (b) NO_2^+
 (c) NO_2 (d) NO_2^-
17. Which of the following are not aromatic [DCE 2001]
 (a) Benzene
 (b) Cyclo-octatetrayenyl dianion
 (c) Tropylium cation
 (d) Cyclopentadienyl cation
18. Arrangement of $(CH_3)_3 - C - (CH_2)_3 - CH - CH_3 - CH_2 - CH_3$ when attached to benzyl or an unsaturated group in increasing order of inductive effect is [AIEEE 2002]
 (a) $(CH_3)_3 - C - < (CH_3)_2 - CH - < CH_3 - CH_2 -$
 (b) $CH_3 - CH_2 - < (CH_3)_2 - CH - < (CH_3)_3 - C -$
 (c) $(CH_3)_2 - CH - < (CH_3)_3 - C - < CH_3 - CH_2 -$
 (d) $(CH_2)_3 - C - < CH_3 - CH_2 - < (CH_3)_2 - CH -$
19. Which of the following is observed in ethylene molecule [MH CET 2002]
 (a) Electromeric effect (b) Inductive effect
 (c) Homolytic fission (d) None of these
20. Cyclopentadienyl anion is [Orissa JEE 2003]
 (a) Aromatic (b) Non-aromatic
 (c) Non-planar (d) Aliphatic
21. Orbital interaction between the sigma bonds of a substituent group and a neighbouring π orbital is known as [Kerala PMT 2004]
 (a) Hyperconjugation
 (b) Inductive effect
 (c) Steric effect
 (d) Dipole-dipole interactions
 (e) Electric quadrupole interactions
22. Which of the following is the most stable compound [BHU 2004]

- (a) Ph_3C^+ (b) Ph_2CH^+
 (c) $Ph_3CH_2^+$ (d) $PhCH_2^+$

23. Which of the following will be most easily attacked by an electrophile [MP PET 2004]



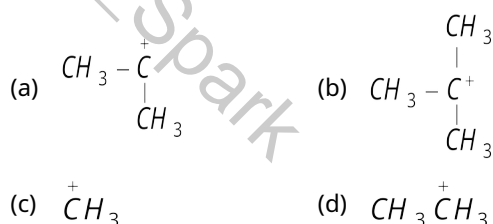
24. Reactivity towards nucleophilic addition reaction of (I) $HCHO$, (II) CH_3CHO , (III) CH_3COCH_3 is [Orissa JEE 2004]

- (a) $II > III > I$ (b) $III > II > I$
 (c) $I > II > III$ (d) $I > II < III$

25. Which of the following resonating structures of 1-methoxy-1, 3-butadiene is least stable [IIT Screening 2005]

- (a) $\overset{+}{O} - CH_3 - CH = CH - CH_2$
 (b) $CH_2 = CH - \overset{+}{O} - CH_3 - CH$
 (c) $CH_2 = CH - CH = \overset{+}{O} - CH_3$
 (d) $CH_2 = CH - CH - \overset{+}{O} - CH_3$

26. Which amongst the following is the most stable carbocation [CBSE PMT 2005]

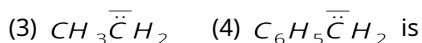


27. Which is the decreasing order of stability [IIT-JEE (Screening) 1993]

- (i) $CH_3 - \overset{+}{C}H - CH_3$
 (ii) $CH_3 - \overset{+}{C}H - O - CH_3$
 (iii) $CH_3 - \overset{+}{C}H - CO - CH_3$
 (a) $(i) < (ii) < (iii)$ (b) $(i) > (ii) > (iii)$
 (c) $(iii) > (ii) > (i)$ (d) $(ii) > (iii) > (i)$

28. The order of decreasing stability of the carbanions

- (1) $(CH_3)_3\bar{C}$ (2) $(CH_3)_2\bar{C}H$



[KCET 1996]

- (a) $1 > 2 > 3 > 4$ (b) $4 > 3 > 2 > 1$
(c) $4 > 1 > 2 > 3$ (d) $1 > 2 > 4 > 3$

29. Choose the chain terminating step

- (1) $\text{H}_2 \rightarrow \text{H}^\bullet + \text{H}^\bullet$
(2) $\text{Br}_2 \rightarrow \text{Br}^\bullet + \text{Br}^\bullet$
(3) $\text{Br}^\bullet + \text{HBr} \rightarrow \text{H}^\bullet + \text{Br}_2$
(4) $\text{H}^\bullet + \text{Br}_2 \rightarrow \text{HBr} + \text{Br}^\bullet$
(5) $\text{Br}^\bullet + \text{Br}^\bullet \rightarrow \text{Br}_2$

[RPET 2000]

- (a) 1 (b) 3
(c) 4 (d) 5

30. The compound, which gives the most stable carbonium on dehydrogenation [UPSEAT 2001]

- (a) $\text{CH}_3 - \underset{\text{CH}_3}{\text{CH}} - \text{CH}_2\text{OH}$
(b) $\text{CH}_3 - \underset{\text{CH}_3}{\text{C}} - \text{OH}$
(c) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2\text{OH}$
(d) $\text{CH}_3 - \underset{\text{CH}_3}{\text{CH}} - \text{CH}_2 - \text{CH}_3$

31. Which of the following requires radical intermediate

[Orissa JEE 2004]

- (a) $\text{CH}_3 - \text{CH} = \text{CH}_2 + \text{HBr} \rightarrow \text{CH}_3 - \underset{\text{Br}}{\text{CH}} - \text{CH}_3$
(b) $\text{CH}_3 - \text{CHO} + \text{HCN} \rightarrow \text{CH}_3 - \text{CH}(\text{CN}) - \text{OH}$
(c) $\text{CH}_3 - \text{CH} = \text{CH}_2 + \text{HBr} \rightarrow \text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{Br}$
(d) $\text{CH}_3\text{CHO} + \text{NH}_2\text{OH} \xrightarrow{\text{H}^+} \text{CH}_3 - \text{CH} = \text{N} - \text{OH}$

32. Which of the following species is paramagnetic in nature

[NCERT 1984]

- (a) Free radical (b) Carbonium ion
(c) Carbanion (d) All the above

33. In which of the following species the central C-atom is negatively charged [NCERT 1985]

- (a) Carbanion (b) Carbonium ion
(c) Carbocation (d) Free radical

34. Which of the following free radicals is most stable

[NCERT 1982]

- (a) Primary (b) Methyl

- (c) Secondary (d) Tertiary

35. Which of the following contains three pairs of electrons

[BHU 1985]

- (a) Carbocation (b) Carbanion
(c) Free radical (d) None of these

36. Which of the following carbanion is most stable

[NCERT 1983]

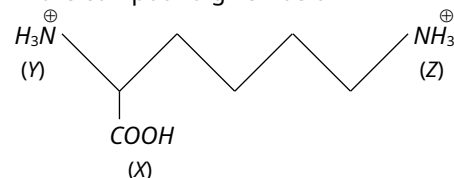
- (a) Methyl (b) Primary
(c) Secondary (d) Tertiary

37. Among the given cations, the most stable carbonium ion is

[IIT-JEE 1981]

- (a) *sec*-butyl (b) *ter*-butyl
(c) *n*-butyl (d) None of these

38. In the compound given below



The correct order of the acidity of the positions (X), (Y) and (Z) is [IIT-JEE Screening 2004]

- (a) $(Z) > (X) > (Y)$ (b) $(X) > (Y) > (Z)$
(c) $(X) > (Z) > (Y)$ (d) $(Y) > (X) > (Z)$

39. C-C bond length in benzene is

[MP PMT 1987; MP PMT 2001; AIIMS 2001]

- (a) 1.39 \AA
(b) 1.54 \AA
(c) 1.34 \AA
(d) Different in different bonds

40. Heterolysis of carbon-chlorine bond produces

[MNR 1986; MP PET/PMT 1998]

- (a) Two free radicals
(b) Two carbonium ions
(c) Two carbanions
(d) One cation and one anion

41. In $\text{CH}_3\text{CH}_2\text{OH}$, the bond that undergoes heterolytic cleavage most readily is [IIT-JEE 1988]

- (a) C - C (b) C - O
(c) C - H (d) O - H

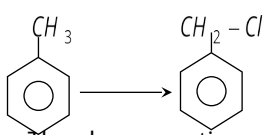
42. Which of the following intermediate have the complete octet around the carbon atom [Orissa JEE 2003]

- (a) Carbonium ion (b) Carbanion ion
(c) Free radical (d) Carbene

43. A solution of D (+) - 2-chloro-2-phenylethane in toluene racemises slowly in the presence of small amount of SbCl_5 , due to the formation of [IIT-JEE 1999]

- (a) Carbanion (b) Carbene
(c) Free radical (d) Carbocation
44. The reagent in Friedel Craft's reaction is [DPMT 2005]
(a) Pyridine (b) $RCOCl$
(c) $RCOOH$ (d) HCl
45. Which gives monosubstituted product [DPMT 2005]
(a) *O*-dinitrobenzene (b) *M*-dinitrobenzene
(c) *P*-dinitrobenzene (d) Nitrobenzene
46. An aromatic compounds among other things should have a π -electron cloud containing electrons where n can't be [J & K 2005]
(a) $1/2$ (b) 3
(c) 2 (d) 1
47. Which of the following is an electrophile [J & K 2005]
(a) H_2O (b) SO_3
(c) NH_3 (d) ROR
48. The presence of the chlorine atom on benzene ring makes the second substituent enter at a position [J & K 2005]
(a) *ortho* (b) *meta*
(c) *para* (d) *ortho/para*
49. Which is the most stable carbocation [J & K 2005]
(a) iso-propyl (b) Triphenylmethyl cation
(c) Ethyl cation (d) π -propyl cation

Organic reactions and their mechanism

1. To which of the following four types does this reaction belong $B^- + R - A \rightarrow B - R + A^-$ [Manipal MEE 1995]
(a) Unimolecular electrophilic substitution
(b) Bimolecular electrophilic substitution
(c) Unimolecular nucleophilic substitution
(d) Bimolecular nucleophilic substitution
2. An alkyl halide may be converted into an alcohol by [Pb. PMT 2000]
(a) Elimination (b) Addition
(c) Substitution (d) Dehydrohalogenation
3. 
The above reaction proceeds through [AMU 2000]
(a) Nucleophilic substitution
(b) Electrophilic substitution
(c) Free radical substitution
(d) More than one of the above processes
4. Geometry of reaction intermediate in SN^1 reaction is

[MH CET 2001]

- (a) Tetrahedral (b) Planar
(c) Triangular bipyramidal (d) None of these
5.
$$H_3C - \underset{\substack{| \\ CH_3}}{\overset{\substack{CH_3 \\ |}}{C}} - Br + KOH (Aq.) \rightarrow H_3C - \underset{\substack{| \\ CH_3}}{\overset{\substack{CH_3 \\ |}}{C}} - OH + KBr$$

above reaction is [RPMT 2003]
(a) SN^1 (b) SN^2
(c) E_1 (d) Both (a) and (b)
6. In electrophilic substitution reaction nitrobenzene is [Kerala (Med.) 2003]
(a) Meta-directing
(b) Ortho-directing
(c) Para-directing
(d) Not reactive and does not undergo any substitution
(e) Non-selective
7. The most common type of reaction in aromatic compounds is [Orissa JEE 2003]
(a) Elimination reaction
(b) Addition reaction
(c) Electrophilic substitution reaction
(d) Rearrangement reaction
8. The function of $AlCl_3$ in Friedel-Craft's reaction is [KCET 2003]
(a) To absorb HCl (b) To absorb water
(c) To produce nucleophile (d) To produce electrophile
9. Which of the following can't be used in Friedel Craft's reactions [AFMC 2004]
(a) $FeCl_3$ (b) $FeBr_2$
(c) $AlCl_3$ (d) $NaCl$
10. The nitration of a compound is due to the [Pb. PMT 2004]
(a) NO_2 (b) NO_3
(c) NO (d) NO_2^+
11. Dehydrohalogenation of an alkyl halide is a/an [MH CET 2004]
(a) Nucleophilic substitution reaction
(b) Elimination reaction
(c) Both nucleophilic substitution and elimination reaction
(d) Rearrangement
12. Addition of HCl to vinyl chloride gives 1, 1-dichloroethane because of [MP PET 2004]

- (a) Mesomeric effect of Cl
- (b) Inductive effect of Cl
- (c) Restricted rotation around double bond
- (d) None of these

13. Formation of ethylene from acetylene is an example of
 (a) Elimination reaction (b) Substitution reaction
 (c) Addition reaction (d) Condensation reaction
14. Conversion of CH_4 to CH_3Cl is an example of which of the following reaction [Pb. CET 2001]

- (a) Electrophilic substitution
- (b) Free radical addition
- (c) Nucleophilic substitution
- (d) Free radical substitution

15. Following reaction,
 $(CH_3)_3CBr + H_2O \rightarrow (CH_3)_3COH + HBr$ is an example of

- (a) Elimination reaction (b) Free radical substitution [DCE 2002]
- (c) Nucleophilic substitution (d) Electrophilic substitution

16. Which is an electrophile [DCE 2002]

- (a) BCl_3 (b) CH_3OH
- (c) NH_3 (d) $AlCl_4^-$

17. The electrophile in the nitration of benzene is

[Orissa JEE 2004]

- (a) NO_2^+ (b) NO_2
- (c) NO^+ (d) NO_2^-

18. The following compound will undergo electrophilic substitution more readily than benzene [UPSEAT 2004]

- (a) Nitrobenzene (b) Benzoic acid
- (c) Benzaldehyde (d) Phenol

19. Which represents nucleophilic aromatic substitution reaction

[Orissa JEE 2004]

- (a) Reaction of benzene with Cl_2 in sunlight
- (b) Benzyl bromide hydrolysis
- (c) Reaction of $NaOH$ with dinitrofluorobenzene
- (d) Sulphonation of benzene

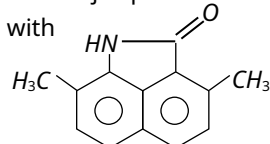
20. Which is an electrophile [DCE 2000]

- (a) $AlCl_3$ (b) CN^-
- (c) NH_3 (d) CH_3OH

21. Strongest nucleophile is [BHU 2003]

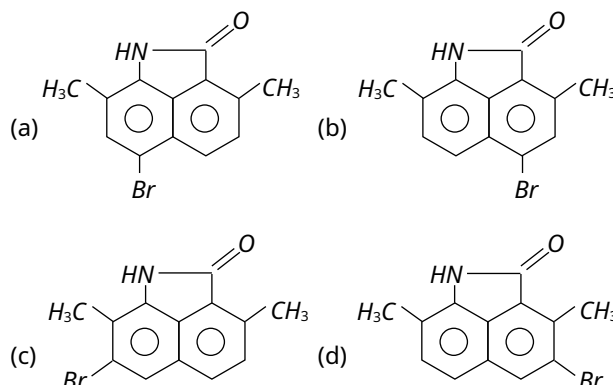
- (a) RNH_2 (b) ROH
- (c) $C_6H_5O^-$ (d) CH_3O^-

22. The major product obtained when Br_2/Fe is treated with



is

[IIT-JEE Screening 2004]



23. Which one of the following is least reactive in a nucleophilic substitution reaction [CBSE PMT 2004]

- (a) CH_3CH_2Cl (b) $CH_2=CHCH_2Cl$
- (c) $(CH_3)_3C-Cl$ (d) $CH_2=CHCl$

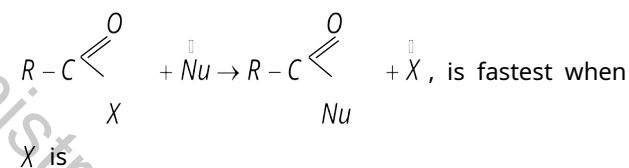
24. Among the following the strongest nucleophile is

[AIIMS 2005]

- (a) C_2H_5SH (b) CH_3COO^-
- (c) CH_3NH_2 (d) $NCCH_2^-$

25. The reaction

[AIEEE 2005]



- (a) Cl (b) NH_2
- (c) OC_2H_5 (d) $OCOR$

26. Elimination of bromine from 2-bromobutane results in the formation of [AIEEE 2004, 05]

- (a) Equimolar mixture of 1 and 2-butene
- (b) Predominantly 2-butene
- (c) Predominantly 1-butene
- (d) Predominantly 2-butyne

27. Examine the following statements pertaining to an SN^2 reaction

- (1) The rate of reaction is independent of the concentration of the nucleophile
- (2) The nucleophile attacks the C^- atom on the side of the molecule opposite to the group being displaced
- (3) The reaction proceeds with simultaneous bond formation and bond rupture/cleavage

Amongst the following which of the above were true

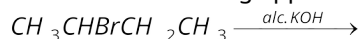
[NCERT 1982]

- (a) 1, 2 (b) 1, 3
- (c) 1, 2, 3 (d) 2, 3

28. What is the decreasing order of reactivity amongst the following compounds towards aromatic electrophilic substitution [IIT-JEE 1995]

- I. Chlorobenzene II. Benzene
 III. Anilinium chloride IV. Toluene
 (a) $I > II > III > IV$ (b) $IV > II > I > III$
 (c) $II > I > III > IV$ (d) $III > I > II > IV$

29. Which of the following applies in the reaction,



- (i) $CH_3CH = CHCH_3$ (major product)
 (ii) $CH_2 = CHCH_2CH_3$ (minor product)

[Orissa JEE 2005]

- (a) Markovnikov's rule (b) Saytzeff's rule
 (c) Kharasch effect (d) Hofmann's rule

30. Bromination of alkanes involves [J & K 2005]

- (a) Carbanions (b) Carbocations
 (c) Carbenes (d) Free radicals

31. Which of the following cannot undergo nucleophilic substitution under ordinary conditions [J & K 2005]

- (a) Chlorobenzene (b) *tert*-butylchloride
 (c) Isopropyl chloride (d) None of these

32. Which of the following alkyl groups has the maximum +I effect [KCET 2002]

- (a) $CH_3 -$ (b) $(CH_3)_2CH -$
 (c) $(CH_3)_3C -$ (d) $CH_3CH_2 -$

Structural and stereo isomerism

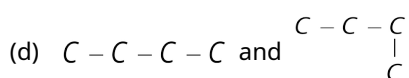
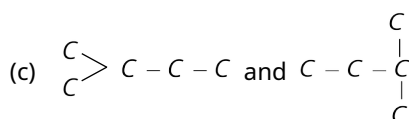
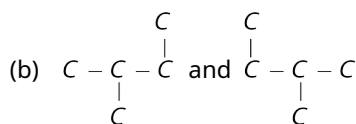
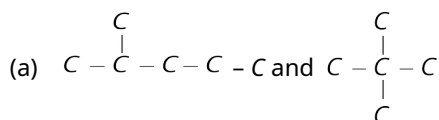
1. Only two isomers of monochloro product is possible of

[IIT-JEE 1986]

- (a) *n*-butane (b) 2,4-dimethyl pentane
 (c) Benzene (d) 1-methyl propane

2. Which is the example of branch isomerization

[NCERT 1976]



3. The isomer of diethyl ether is

[CPMT 1975]

- (a) $(CH_3)_2CHOH$ (b) $(CH_3)_3C - OH$
 (c) C_3H_7OH (d) $(C_2H_5)_2CHOH$

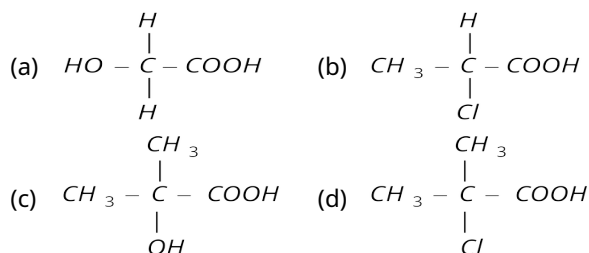
4. Isomers have essentially identical

[CBSE PMT 1988; MP PMT 1983, 86]

- (a) Structural formula (b) Chemical properties
 (c) Molecular formula (d) Physical properties

5. Which one of the following shows optical activity

[NCERT 1984, 90]

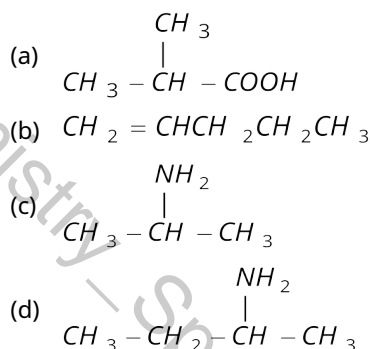


6. In ethane and cyclohexane which one of the following pairs of conformations are more stable

- (a) Eclipsed and chair conformations
 (b) Staggered and chair conformations
 (c) Staggered and boat conformations
 (d) Eclipsed and boat conformations

7. Which of the following may exist in enantiomorphs

[CBSE PMT 1988]



8. Which of the following compounds may not exist as enantiomers [CPMT 1987]

- (a) $CH_3CH(OH)CO_2H$
 (b) $CH_3CH_2CH(CH_3)CH_2OH$
 (c) $C_6H_5CH_2CH_3$
 (d) $C_6H_5CHClCH_3$

9. Number of isomers of molecular formula $C_2H_2Br_2$ are

[CPMT 1987]

- (a) 1 (b) 2
 (c) 3 (d) 0

10. Lactic acid shows which type of isomerism

[CPMT 1987; MP PMT 1987; BHU 2003]

- (a) Geometrical isomerism (b) Tautomerism
 (c) Optical isomerism (d) Metamerism

11. Which one of the following is an optically active compound

[CBSE PMT 1988; DPMT 1983]

- (a) *n*-propanol (b) 2-chlorobutane
(c) *n*-butanol (d) 4-hydroxyheptane
12. Compounds with same molecular formula but different structural formulae are called [BHU 1979; AFMC 1989]

- (a) Isomers (b) Isotopes
(c) Isobars (d) Isoelectronic

13. Which one of the following compounds shows optical isomerism [MP PET 1990]

- (a) $\text{CH}_3\text{CHCl}-\text{CH}_2-\text{CH}_3$
(b) $\text{CH}_3-\text{CH}_2-\text{CHCl}-\text{CH}_2-\text{CH}_3$
(c) $\text{ClCH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3$
(d) $\text{ClCH}_2-\text{CH}_2-\text{CH}_3$

14. Which one of the following objects is 'achiral'

- (a) Letter P (b) Letter F
(c) Ball (d) A pair of hand

15. Total number of isomers of a disubstituted benzene compound is

- (a) 1 (b) 2
(c) 3 (d) 4

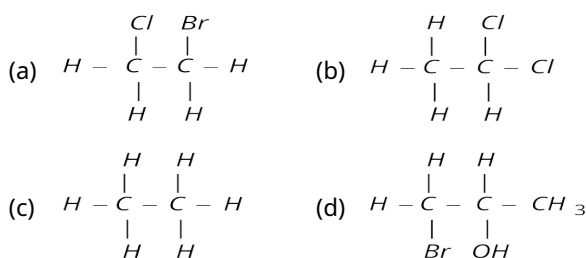
16. Separating of *d* and *l* enantiomorphs from a racemic mixture is called [CBSE PMT 1988; DPMT 1983; KCET 2002]

- (a) Resolution (b) Dehydration
(c) Rotation (d) Dehydrohalogenation

17. Number of optical isomers of lactic acid are

- (a) 1 (b) 2
(c) 3 (d) 4

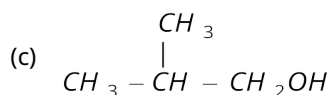
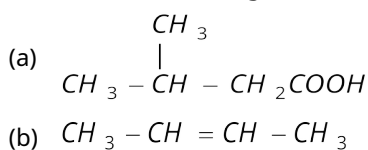
18. Which one of the following contains asymmetric carbon atom [IIT-JEE 1989; Roorkee 2000]



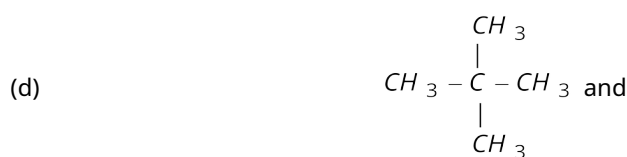
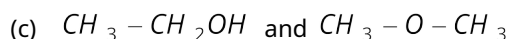
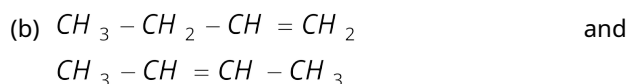
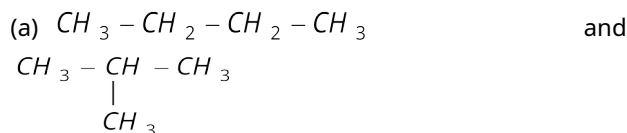
19. *n*-butane and isobutane are examples of

- (a) Chain isomers (b) Geometrical isomers
(c) Position isomers (d) Tautomers

20. Which of the following has chiral structure



21. Which of the following pairs is an example of position isomerism



22. Geometrical isomerism is shown by

[IIT-JEE 1983; CPMT 1990, 94; CBSE PMT 1992; MP PET 1997; AMU (Engg.) 1999]

- (a) 2-butene (b) 2-butyne
(c) 2-butanol (d) Butanal

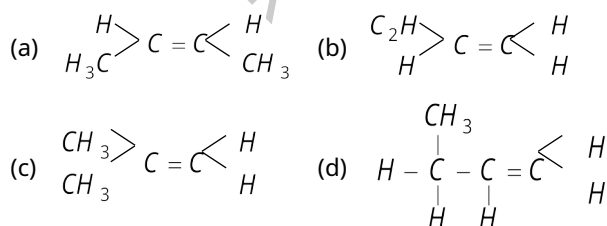
23. An organic compound exhibits optical isomerism when

[CPMT 1971, 78, 81; MP PET 1999]

- (a) Four groups linked to carbon atom are different
(b) Three groups linked to carbon atom are different
(c) Two groups linked to carbon atom are different
(d) All the groups linked to carbon atom are same

24. Which one of the following exhibits geometrical isomerism

[NCERT 1979; DPMT 1984; CBSE PMT 1990]



25. Maximum number of isomers of alkene C_4H_8 are

[IIT-JEE 1982; MP PMT 1985; MADT Bihar 1995; Kerala (Engg.) 2002]

- (a) 2 (b) 3
(c) 4 (d) 6

26. Rotation of plane polarised light is measured by

[CPMT 1985; DCE 2001]

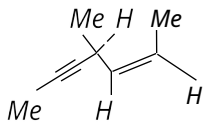
- (a) Manometer (b) Polarimeter

- (c) Viscometer (d) Refractometer
27. An alkane forms isomers if the number of least carbon atom is [CPMT 1976; BHU 1985, 89]
 (a) 1 (b) 2
 (c) 3 (d) 4
28. Which is not found in alkenes [AIIMS 1982; RPMT 1999]
 (a) Chain isomerism (b) Geometrical isomerism
 (c) Metamerism (d) Position isomerism
29. How many isomers of $C_5H_{11}OH$ will be primary alcohols [CBSE PMT 1992]
 (a) 2 (b) 3
 (c) 4 (d) 5
30. The compound $C_4H_{10}O$ can show [IIT-JEE 1981; MP PET 2000]
 (a) Metamerism (b) Functional isomerism
 (c) Positional isomerism (d) All types
31. The number of possible alcoholic isomers for $C_4H_{10}O$ are [DPMT 1984; MNR 1986]
 (a) 4 (b) 2
 (c) 3 (d) 5
32. How many isomers are possible for C_4H_8O [MNR 1992; UPSEAT 2001, 02]
 (a) 3 (b) 4
 (c) 5 (d) 6
33. Which of the following can exhibit *cis-trans* isomerism [CBSE PMT 1989]
 (a) $HC \equiv CH$ (b) $CICH = CHCl$
 (c) $CH_3.CHCl.COOH$ (d) $CICH_2 - CH_2Cl$
34. The number of geometrical isomers in case of a compound with the structure $CH_3 - CH = CH - CH = CH - C_2H_5$ is [NCERT 1980]
 (a) 4 (b) 3
 (c) 2 (d) 5
35. The property by virtue of which a compound can turn the plane polarised light is known as [BHU 1979]
 (a) Photolysis (b) Phosphorescence
 (c) Optical activity (d) Polarization
36. Meso-tartaric acid is optically inactive due to the presence of [AIIMS 1982; MP PMT 1987]
 (a) Molecular symmetry
 (b) Molecular asymmetry
 (c) External compensation
 (d) Two asymmetric C-atoms
37. Which of the following compounds exhibits optical isomerism [BHU 1983; AFMC 1990; CPMT 1993; MP PMT 1999, 2000]
 (a) CH_3CH_2COOH (b) $CH_3CHOHCOOH$
 (c) $CH_3CH_2CH_2OH$ (d) $CH_3CHOHCH_3$
38. The maximum number of stereoisomers possible for 2-hydroxy-2-methyl butanoic acid is [Roorkee 1992]
 (a) 1 (b) 2
 (c) 3 (d) 4
39. Which one of the following pairs represents the stereoisomerism [AIIMS 1992]
 (a) Geometrical isomerism, position isomerism
 (b) Geometrical isomerism, conformational isomerism
 (c) Optical isomerism, geometrical isomerism
 (d) Optical isomerism, metamerism
40. Diethyl ether is not associated with which one of these isomers [AFMC 1993]
 (a) Butanoic acid (b) Methyl propionate
 (c) Stereoisomerism (d) None of these
41. Diethyl ether and methyl *n*-propyl ether are [MP PET 1994; AFMC 1999; MP PMT 2002]
 (a) Position isomers (b) Functional isomers
 (c) Metamers (d) Chain isomers
42. *n*-propyl alcohol and isopropyl alcohol are examples of [MP PMT 1994]
 (a) Position isomerism (b) Chain isomerism
 (c) Tautomerism (d) Geometrical isomerism
43. It is possible to distinguish between optical isomers by [Manipal MEE 1995; AFMC 1995]
 (a) Infrared spectroscopy
 (b) Mass spectrometry
 (c) Melting point determination
 (d) Polarimetry
44. The isomerism exhibited by alkyl cyanide and alkyl isocyanide is [AFMC 1995, 97]
 (a) Functional (b) Positional
 (c) Tautomerism (d) Metamerism
45. The following compound can exhibits

$$\begin{array}{c} CH_3 \\ \diagup \\ C \\ \diagdown \\ CH_3 \end{array} \begin{array}{c} C \\ \diagup \\ C \\ \diagdown \\ CH_3 \end{array} \begin{array}{c} H \\ \diagup \\ C \\ \diagdown \\ COOH \end{array} \begin{array}{c} H \\ \diagup \\ C \\ \diagdown \\ COOH \end{array}$$
 [IIT-JEE 1995; DCE 2000]
 (a) Tautomerism
 (b) Optical isomerism
 (c) Geometrical isomerism
 (d) Geometrical and optical isomerisms

46. Name the compound, that is not isomer with diethyl ether
[IIT-JEE 1981; CPMT 1989; MADT Bihar 1995]
(a) *n*-propylmethyl ether
(b) Butane-1-ol
(c) 2-methylpropane-2-ol
(d) Butanone
47. Which statement is true for cyclohexane [MP PET 1996]
(a) It has two possible isomers
(b) It has three conformations
(c) Boat conformation is most stable
(d) Chair and boat conformations differ in energy by 44 kJ/mol
48. Two compounds have the structural formulae $CH_3 - O - CH_2CH_3$ and $CH_3 - CH_2 - CH_2OH$. The above is an example of
(a) Metamerism (b) Functional isomerism
(c) Positional isomerism (d) Chain isomerism
49. Which of the following pairs are not isomeric compounds
(a) Ethyl ethanoate and methyl propanoate
(b) Butanone and butanal
(c) Ethoxy propane and propoxy ethane
(d) Methoxy methane and ethanol
50. Functional isomerism is exhibited by the following pair of compounds
(a) Acetone, propionaldehyde
(b) Diethyl ether, methyl propyl ether
(c) Butane, isobutane
(d) 1-butene, 2-butene
51. The total number of possible isomeric trimethyl benzene is
[MP PET 1997]
(a) 2 (b) 3
(c) 4 (d) 6
52. Optically active isomers but not mirror images are called
[MP PET 1999]
(a) Enantiomers (b) Mesomers
(c) Tautomers (d) Diastereoisomers
53. C_7H_9N has how many isomeric forms that contain a benzene ring [CPMT 1997, 99; JIPMER 2002; DCE 2003]
(a) 4 (b) 5
(c) 6 (d) 7
54. The total number of isomers formed by C_5H_{10} is
[Bihar MEE 1996]
(a) 2 (b) 3
(c) 4 (d) 5
- (e) None of these
55. Which of the following contains asymmetric centre
[CPMT 1996]
(a) 2-butene (b) 2, 2-dimethylpropane
(c) 2-hexyne (d) Lactic acid
56. Which of the following cannot be given to exemplify chiral structure [JIPMER 1997]
(a) A shoe (b) A screw
(c) A screw driver (d) All of these
57. Which of the following is expected to be optically active
[JIPMER 1997]
(a) $(CH_3)_4C$ (b) $C_2H_5CH(CH_3)C_3H_7$
(c) $(C_2H_5)_2CHCH_3$ (d) $CH_3CH=CHCH_3$
58. Which compound does not show geometrical isomerism
[RPMT 1997]
(a) 2-butene (b) 2-pentene
(c) 2,3-dibromo-2-butene (d) 2-methyl propene
59. The isomers which can be converted into another forms by rotation of the molecules around single bond are
[AIIMS 1997]
(a) Geometrical isomers (b) Conformers
(c) Enantiomers (d) Diastereomers
60. The number of enantiomers of the compound $CH_3CHBrCHBrCOOH$ is
[AIIMS 1997]
(a) 0 (b) 1
(c) 3 (d) 4
61. $C_6H_5C \equiv N$ and $C_6H_5N \equiv C$ exhibit which type of isomerism
[CPMT 1997]
(a) Position (b) Functional
(c) Dextro isomerism (d) Metamerism
62. Which of the following compounds is not chiral
[CBSE PMT 1998; DPMT 2002]
(a) $DCH_2CH_2CH_2Cl$ (b) CH_3CH_2CHDCl
(c) $CH_3CHDCH_2CH_2Cl$ (d) $CH_2CHClCH_2D$
63. *cis* and *trans* 2-butene are [BHU 1998; DPMT 2002]
(a) Conformational isomers (b) Optical isomers
(c) Position isomers (d) Geometrical isomers
64. Which one of the following is the chiral molecule
[BHU 1998; 2005]
(a) CH_3Cl (b) CH_2Cl_2
(c) $CHBr_3$ (d) $CHClBrI$
65. Cyanide and isocyanide are isomers of type [AFMC 1997]
(a) Positional (b) Functional

- (c) Tautomer (d) Structural
66. Glucose and fructose are [AMU (Engg.) 1999]
 (a) Optical isomers (b) Functional isomers
 (c) Position isomers (d) Chain isomers
67. Which of the following compounds which is an optically active compound [UPSEAT 1999]
 (a) 1-butanol (b) 2-butanol
 (c) 3-butanol (d) 4-heptanol
68. *d*-tartaric acid and *l*-tartaric acid are [MH CET 1999]
 (a) Enantiomers (b) Tautomers
 (c) Diastereoisomers (d) Structural isomers
69. Minimum resistance in bond rotation will be observed in the compound [RPMT 1999]
 (a) Hexachloroethane (b) Ethylene
 (c) Acetylene (d) Ethane
70. Which pair show cis-trans isomerism [RPET 1999]
 (a) Maleic-fumaric acid (b) Lactic-tartaric acid
 (c) Malonic-succinic acid (d) Crotonic-acrylic acid
71. 1, 2-Dichloroethene shows [RPET 1999]
 (a) Geometrical isomerism (b) Optical isomerism
 (c) Ring-chain isomerism (d) Resonance
72. Which compound is optically active [DCE 1999]
 (a) 4-chloro, 1 hydroxy butane
 (b) 3°-butyl alcohol
 (c) Secondary butyl amine
 (d) *n*-butyl alcohol
73. Choose the pair of chain isomer [RPMT 2000]
 (a) CH_3CHBr_2 and $\text{CH}_2\text{BrCH}_2\text{Br}$
 (b) 1-propanol and 2-propanol
 (c) Neo-pentane and isopentane
 (d) Diethyl ether and methyl-*n*-propyl ether
74. Optical isomerism arises due to the presence of [RPMT 2000]
 (a) An asymmetric carbon atom
 (b) Centre of symmetry
 (c) Axis of symmetry
 (d) Plane of symmetry
75. Least hindered rotation about carbon-carbon bond is observed in [RPMT 2000]
 (a) Ethane (b) Ethylene
 (c) Ethyne (d) Hexachloroethane
76. Which pair represents chain isomer [RPMT 2000]
 (a) CH_3CHCl_2 and $\text{ClCH}_2\text{CH}_2\text{Cl}$
 (b) *n*-propyl alcohol and isopropyl alcohol
 (c) 2-methyl-1 propanol and 2-Methyl-2 propanol
 (d) 2-methyl butane and neopentane
77. Which of the following compounds will exhibit geometrical isomerism [IIT-JEE Screening 2000]
 (a) 1-phenyl-2-butene (b) 3-phenyl-1-butene
- (c) 2-phenyl-1-butene (d) 1, 1-Diphenyl-1-propene
78. On bromination, propionic acid yields two isomeric 2-bromopropionic acids. This pair is an important example of [BHU 2000]
 (a) Chain isomers (b) Optical isomers
 (c) Cis-trans isomers (d) Position isomers
79. Geometrical isomerism is not possible in [CPMT 2000]
 (a) Propene (b) 3-hexane
 (c) Butenedioic acid (d) Cyclic compound
80. Only two isomeric monochloro derivatives are possible for [Pb. PMT 2000]
 (a) 2-methyl propane (b) *n*-pentane
 (c) Benzene (d) 2, 4-dimethyl pentane
81. Lactic acid in which a methyl group, a hydroxyl group, a carboxylic acid group and a hydrogen atom are attached to a central carbon atom, shown optical isomerism due to the molecular geometry at the [Pb. PMT 2000]
 (a) Central carbon atom
 (b) Carbon atom of the methyl group
 (c) Carbon atom of the carboxylic acid group
 (d) Oxygen of the hydroxyl groups
82. The number of possible alkynes with molecular formula C_5H_8 is [MP PMT 2000]
 (a) 2 (b) 3
 (c) 4 (d) 5
83. Which of the following will not lose asymmetry on reduction with LiAlH_4 [Roorkee 2000]
- (a) $\text{HOH}_2\text{C}-\overset{\text{CHO}}{\underset{\text{CH}=\text{CH}_2}{\text{C}}}-\text{CH}_2\text{CH}_3$
- (b) $\text{H}_2\text{C}=\text{HCO}-\overset{\text{CH}_3}{\underset{\text{CH}_2\text{CH}_3}{\text{C}}}-\text{CHO}$
- (c) $\text{HOH}_2\text{C}-\overset{\text{CH}_3}{\underset{\text{C}\equiv\text{CH}}{\text{C}}}-\text{COOH}$
- (d) $\text{H}_3\text{C}-\overset{\text{CHO}}{\underset{\text{CH}_2\text{NH}_2}{\text{C}}}-\text{C}\equiv\text{N}$
84. Reason for geometrical isomerism by 2-butene is [CBSE PMT 2000]
 (a) Chiral carbon
 (b) Free rotation about single bond
 (c) Free rotation about double bond

- (d) Restricted rotation about double bond
85. Stereoisomers which are not the mirror images of one another are called [RPM T 2000]
 (a) Enantiomers (b) Mesomers
 (c) Tautomers (d) Diastereoisomers
86. The isomerism shown by *n*-butyl alcohol and isobutyl alcohol is [RPM T 2000]
 (a) Metamerism (b) Chain
 (c) Position (d) Stereo
87. Which is optically active [MH CET 2001]
 (a) CH_2Cl_2
 (b) CHCl_3
 (c) Meso form of tartaric acid
 (d) Glyceraldehyde
88. Which of the following will show geometrical isomerism [CPMT 2001; BHU 2005]
 (a) $\text{CH}_3\text{CH}=\text{CHCH}_3$ (b) $(\text{CH}_3)_2\text{C}=\text{C}(\text{CH}_3)_2$
 (c) $(\text{CH}_3)_2\text{C}=\text{C}(\text{CH}_3)_2$ (d) $\text{CH}_3-\text{CH}=\text{C}(\text{CH}_3)_2$
89. What is the maximum number of open chain structures possible for C_4H_8 [MP PET 2001]
 (a) 2 (b) 3
 (c) 4 (d) 1
90. Glucose has optical isomers [DCE 2001]
 (a) 8 (b) 12
 (c) 16 (d) Cannot be predicted
91. An organic compound $^1\text{CH}_3-^2\text{CH}_2-^3\text{CH}_2-^4\text{CH}_2-^5\text{CH}_2-^6\text{CH}_2-^7\text{CH}_3$
 To make it chiral compound the attack should be on which carbon atom [DCE 2001]
 (a) 1 (b) 3
 (c) 4 (d) 7
92. Which of the following statements is not true about enantiomers [DCE 2001]
 (a) They have same physical properties
 (b) They have different biological properties
 (c) They have same chemical properties towards chiral compounds
 (d) None of these
93. Meso-tartaric acid is [BHU 2001]
 (a) Optically inactive
 (b) Optically active because of molecular symmetry
 (c) Optically inactive due to external compensation
 (d) Optically active because of asymmetric carbon atom
94. The number of possible isomers of the compound with molecular formula $\text{C}_7\text{H}_8\text{O}$ is [BHU 2001]
 (a) 3 (b) 5
 (c) 7 (d) 9
95. The number of isomers for the compound with molecular formula C_2BrClFI is [IIT-JEE (Screening) 2001]
 (a) 3 (b) 4
 (c) 5 (d) 6
96. Hydrogenation of the adjoining compound in the presence of poisoned palladium catalyst gives [IIT-JEE (Screening) 2001]
- 
- (a) An optically active compound
 (b) An optically inactive compound
 (c) A racemic mixture
 (d) A diastereomeric mixture
97. The number of possible structural isomers for a compound with the molecular formula C_7H_{16} is [DCE 2001]
 (a) 8 (b) 9
 (c) 10 (d) 12
98. Which of the following molecule contains asymmetric carbon atom [JIPMER 2002]
 (a) $\text{CH}_3\text{CHClCOOH}$ (b) $\text{CH}_3\text{CH}_2\text{COOH}$
 (c) $\text{ClCH}_2\text{CH}_2\text{COOH}$ (d) Cl_2CHCOOH
99. A similarity between optical and geometrical isomerism is that [AIEEE 2002]
 (a) Each forms equal number of isomers for a given compound
 (b) If in a compound one is present then so is the other
 (c) Both are included in stereoisomerism
 (d) They have no similarity
100. If the light waves pass through a nicol prism then all the oscillations occur only in one plane, such beam of light is called as [Kerala (Med.) 2002]
 (a) Non-polarised light (b) Plane polarised light
 (c) Polarised light (d) Optical light
101. Racemic mixture is formed by mixing two [AIEEE 2002]
 (a) Isomeric compounds (b) Chiral compounds
 (c) Meso compounds (d) Optical isomers

102. Which of the following does not show geometrical isomerism [AIEEE 2002]

- (a) 1, 2 dichloro-1-pentene
(b) 1, 3-dichloro-2-pentene
(c) 1, 1-dichloro-1-pentene
(d) 1, 4-dichloro-2-pentene

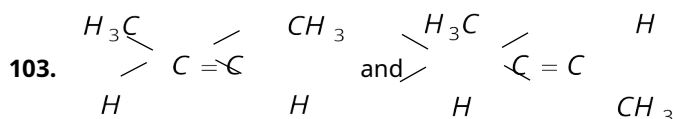


exhibit which isomerism

[MP PET 2002]

- (a) Position isomerism (b) Geometrical isomerism
(c) Optical isomerism (d) Functional isomerism

104. Which compound is chiral [RPMT 2002]

- (a) butane
(b) 1-chloro-2-methyl butane
(c) 2-methyl butane
(d) 2-methyl propane

105. Methyl acetate and propionic acid are [RPMT 2002]

- (a) Functional isomer (b) Structural isomer
(c) Stereoisomer (d) Geometrical isomer

106. Which compound shows *cis-trans* isomerism [CPMT 2002]

- (a) 1-butene (b) 2-propene
(c) 2-butene (d) Benzene

107. Isomers of propionic acid are [MP PMT 2002]

- (a) $HCOOC_2H_5$ and CH_3COOCH_3
(b) $HCOOC_2H_5$ and $C_3H_7COOCH_3$
(c) CH_3COOCH_3 and C_3H_7OH
(d) C_3H_7OH and CH_3COCH_3

108. The functional isomer of ethyl alcohol is [MP PMT 2002]

- (a) CH_3OCH_3 (b) CH_3COCH_3
(c) CH_3COOH (d) CH_3CH_2CHO

109. Disymmetric object is one which is [Kerala (Engg.) 2002]

- (a) Superimposable on its mirror image
(b) Non-superimposable on its mirror image
(c) Optically inactive
(d) Achiral

110. Geometrical isomers differ in [CBSE PMT 2002]

- (a) Position of atoms
(b) Length of carbon
(c) Spatial arrangement of atoms
(d) Position of functional group

111. Which of the following hydride is capable of showing conformations [IPMER 2002]

- (a) $NH_2 - NH_2$ (b) B_2H_6

- (c) CH_4 (d) None of these

112. Which of the following is an chiral compound

[AIIMS 2002]

- (a) Hexane (b) Methane
(c) *n*-butane (d) 2,3,4-trimethyl hexane

113. What is the possible number of optical isomers for a compound containing 2-dissimilar asymmetric carbon atom

[CPMT 1999; UPSEAT 1999, 2000, 02]

- (a) 2 (b) 4
(c) 6 (d) 8

114. Which of the following compounds is optically active

[Pb. PMT 2001; AMU 2002; Kerala (Med.) 2003]

- (a) $(CH_3)_2CHCH_2OH$ (b) CH_3CH_2OH
(c) CCl_2F_2 (d) $CH_3CHOHC_2H_5$

115. Optically active compound is [UPSEAT 2002]

- (a) 3-chloropentane (b) 2-chlorobutane
(c) 2-chloropropane (d) None of these

116. If a carbon atom is attached to $-H, -OH, -COOH$ and $-OCOC_2H_5$ number of chiral C - atoms in compound is

[RPMT 2003]

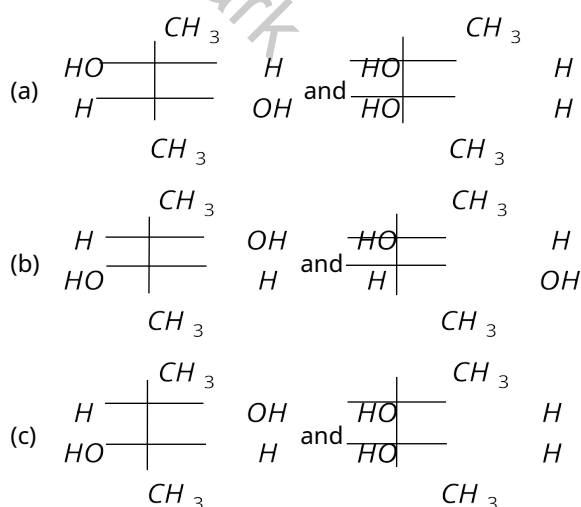
- (a) 1 (b) 2
(c) 3 (d) 4

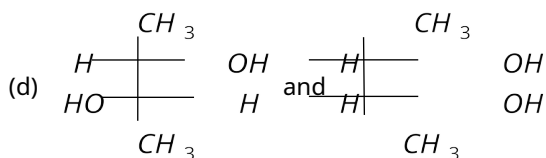
117. Isomerism due to rotation round single bond of carbon-carbon is [UPSEAT 2003]

- (a) Conformation (b) Enantiomerism
(c) Diastereo isomerism (d) Position isomerism

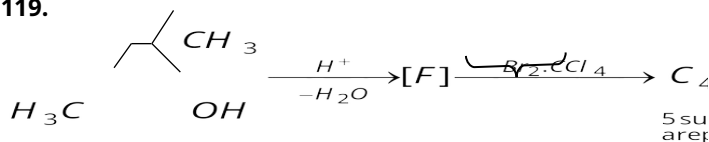
118. Which of the following pairs of compounds are enantiomers

[CBSE PMT 2003]





119.



How many structures of *F* is possible

[IIT-JEE (Screening) 2003]

- (a) 2 (b) 5
(c) 6 (d) 3

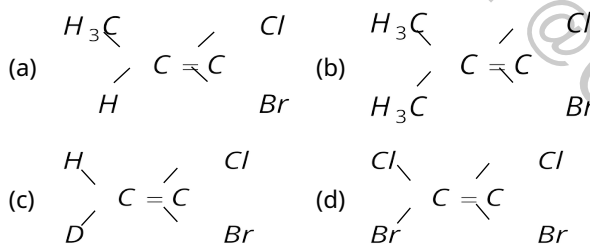
120. An enantiomerically pure acid is treated with racemic mixture of an alcohol having one chiral carbon. The ester formed will be

[IIT-JEE (Screening) 2003]

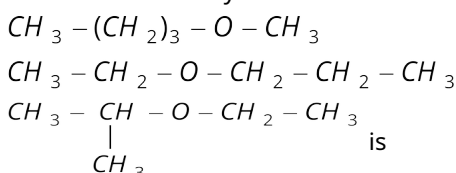
- (a) Optically active mixture (b) Pure enantiomer
(c) Meso compound (d) Racemic mixture

121. Which one of the following will not show geometrical isomerism

[MP PMT 2003]



122. Isomerism shown by



[RPMT 2003]

- (a) Position isomerism (b) Chain isomerism
(c) Metamerism (d) Optical isomerism

123. A compound whose molecules are superimposable on their mirror images even though they contain an asymmetric carbon atom is called

[Kerala (Med.) 2003]

- (a) A meso compound (b) An erythro isomer
(c) A threo isomer (d) a glycol

124. Of the following, the compound possessing optical isomerism

[Kerala (Med.) 2003]

- (a) $\text{CH}_3\text{CH}_2\text{OH}$ (b) CH_3CHClBr
(c) CCl_2BrF (d) CCl_2F_2

125. Which of the following statement is wrong

[EAMCET 2003]

- (a) Diethyl ketone and methyl propyl ketone are position isomers
(b) 2-chloro pentane and 1-chloro pentane are position isomers
(c) *n*-butane and 2-methyl propane are chain isomers
(d) Acetone and propionaldehyde are functional isomers

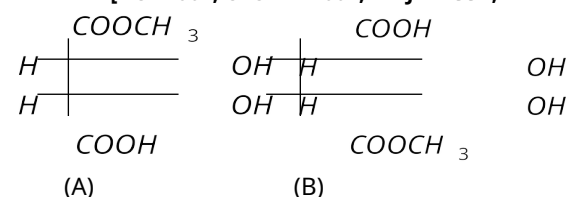
126. Dimethyl ether and ethyl alcohol are

[MH CET 2004; Pb. CET 2002]

- (a) Metamers (b) Homologues
(c) Functional isomers (d) Position isomers

127. The correct statement about the compounds *A* and *B* is

[DCE 2002; UPSEAT 2004; IIT-JEE 1997; DPMT 2005]



- (a) *A* and *B* are identical
(b) *A* and *B* are diastereomers
(c) *A* and *B* are enantiomers
(d) None of these

128. Ethyl acetoacetate shows, which type of isomerism

[Pb. CET 2003]

- (a) Chain (b) Optical
(c) Metamerism (d) Tautomerism

129. Which of the following will have a mesoisomer also

[AIEEE 2004]

- (a) 2, 3-Dichloropentane
(b) 2, 3-Dichlorobutane
(c) 2-Chlorobutane
(d) 2-Hydroxypropanoic acid

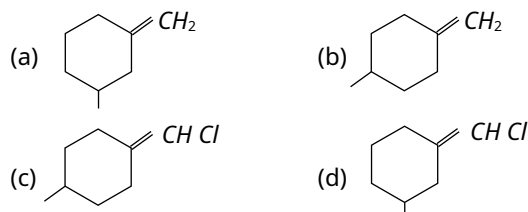
130. For which of the following parameters the structural isomers $\text{C}_2\text{H}_5\text{OH}$ and CH_3OCH_3 would be expected to have the same values ? (Assume ideal behaviour)

[AIEEE 2004]

- (a) Boiling points
(b) Vapour pressure at the same temperature
(c) Heat of vaporization
(d) Gaseous densities at the same temperature and pressure

131. The geometrical isomerism is shown by

[AIIMS 2004]



132. Which of the following compounds will exhibit *cis-trans* isomerism

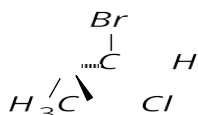
[Kerala PMT 2004]

- (a) 2-butene (b) 2-butyne
(c) 2-butanol (d) Butanone
(e) Butanol
133. Which of the following compounds exhibit stereoisomerism

[MP PMT 2004]

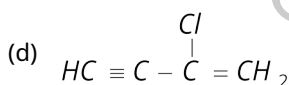
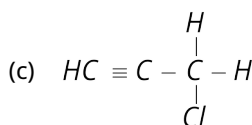
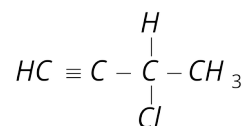
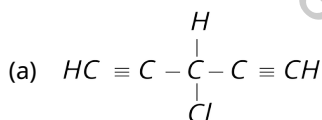
- (a) 2-methyl-butane I (b) 3-methyl-butanoic acid
(c) 3-methyl-butyne I (d) 2-methyl butanoic acid
134. The chirality of the compound

[CBSE PMT 2005]



- (a) R (b) S
(c) Z (d) E
135. Which of the following is most likely to show optical isomerism

[UPSEAT 2004]



136. Nitroethane can exhibit one of the following kind of isomerism

[DCE 2004]

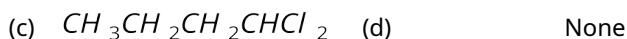
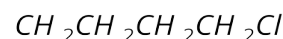
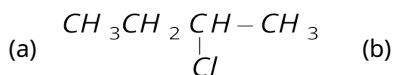
- (a) Metamerism (b) Optical activity
(c) Tautomerism (d) Position isomerism
137. $CH_3CH(OH).COOH$ shows

[BVP 2004]

- (a) Geometrical isomerism (b) Optical isomerism
(c) Both (d) None

138. Which will have enantiomer

[BVP 2004]



139. The total number of acyclic isomers including the stereoisomers with the molecular formula C_4H_7Cl

[Pb. CET 2004]

- (a) 11 (b) 12
(c) 9 (d) 10
140. The number of possible enantiomeric pairs that can be produced during mono-chlorination of 2-methylbutane is

[Pb. CET 2004]

- (a) 3 (b) 4
(c) 1 (d) 2

141. Which one of the following pairs represents stereoisomerism

[CBSE PMT 2005]

- (a) Chain isomerism and rotational isomerism
(b) Structural isomerism and geometric isomerism
(c) Linkage isomerism and geometric isomerism
(d) Optical isomerism and geometric isomerism

142. When isomers have the same structural formula but differ in relative arrangement of atoms or groups are called

[CPMT 2000; KCET (Med.) 2000]

- (a) Mesomers (b) Stereoisomers
(c) Optical isomers (d) Geometrical mesomers

143. $CH_3CH_2CH=CH_2$ and $CH_3-CH=CH-CH_3$ show

- (a) Chain isomerism (b) Position isomerism
(c) Functional isomerism (d) Metamerism

144. The number of possible isomers of butene are

[Kerala (Engg.) 2002]

- (a) 3 (b) 2
(c) 4 (d) 5
(e) 6

145. Which of the following show geometrical isomerism

[BCECE 2005]

- (a) C_2H_5Br (b) $(CH_2)(COOH)_2$
(c) $(CH)_2(COOH)_2$ (d) C_2H_6

146. Among the following the most stable compound is

[AIIMS 2005]

- (a) *cis*-1,2-cyclohexanediol
(b) *trans*-1,2-cyclohexanediol
(c) *cis*-1,3-cyclohexanediol
(d) *trans*-1,3-cyclohexanediol

147. Chirality of carbon compound is because of its

[Kerala (Med.) 2002]

- (a) Tetrahedral nature of carbon
(b) Monovalent nature of carbon
(c) Divalent nature of carbon
(d) Trivalent nature of carbon

148. Which kind of isomerism is possible for 1-chloro-2-nitroethene

[J & K 2005]

- (a) Functional group isomerism
(b) Position isomerism
(c) *E/Z* isomerism
(d) Optical isomerism

149. Which will give chiral molecule

[DPMT 2005]



- (b) $C_2H_5CHO \xrightarrow{CH_3MgBr} \xrightarrow{H^+ / H_2O}$
- (c) $(CH_3)_2CHC_2H_5 \xrightarrow{Cu}$
- (d) $\begin{array}{c} H \\ \diagup \\ C = C \\ \diagdown \\ CH_3 \end{array} \begin{array}{c} CH_3 \\ \diagdown \\ C \\ \diagup \\ CH_3 \end{array} \xrightarrow{Cl_2}$

150. Which of the following will be chiral

[J & K 2005]

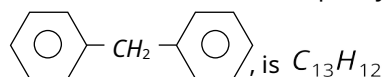
- (a) CH_3CHCl_2 (b) $CH_3CHBrCl$
 (c) CD_2Cl_2 (d) CH_2ClBr

151. Which of the following fischer projection formula is same as D-Glyceraldehyde [Kerala CET 2005]

- (a) $\begin{array}{c} CH_2OH \\ | \\ OH - C - CHO \\ | \\ H \end{array}$
- (b) $\begin{array}{c} CH_2OH \\ | \\ H - C - OH \\ | \\ CHO \end{array}$
- (c) $\begin{array}{c} CHO \\ | \\ OH - C - CH_2OH \\ | \\ H \end{array}$
- (d) $\begin{array}{c} CHO \\ | \\ H - C - CH_2OH \\ | \\ HO \end{array}$
- (e) $\begin{array}{c} H \\ | \\ OH - C - CH_2OH \\ | \\ CHO \end{array}$

(d) Staggered conformation

2. The molecular formula of diphenyl methane,



How many structural isomers are possible when one of the hydrogens is replaced by a chlorine atom [CBSE PMT 2004]

- (a) 8 (b) 7
 (c) 6 (d) 4

3. S_N^1 reaction is faster in [Orissa JEE 2004]

- (a) CH_3CH_2Cl (b) $\begin{array}{c} CH_3 \\ \diagup \\ CH - Cl \\ \diagdown \\ CH_3 \end{array}$
 (c) $\begin{array}{c} CH_3 \\ | \\ CH_3 - C - Cl \\ | \\ CH_3 \end{array}$ (d) $\begin{array}{c} CH_3 - CH - Cl \\ | \\ CH_2 \\ | \\ CH_3 \end{array}$

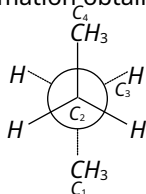
4. How many enantiomer pairs are obtained by monochlorination of 2, 3-dimethylbutane [Kerala PMT 2004]

- (a) Nil (b) Four
 (c) Two (d) Three
 (e) One

5. Among the following compounds which can be dehydrated very easily is [AIIEE 2004]

- (a) $CH_3 - CH_2 - \begin{array}{c} CH_3 \\ | \\ C - CH_2 - CH_3 \\ | \\ OH \end{array}$
 (b) $CH_3 - CH_2 - CH_2 - \begin{array}{c} OH \\ | \\ CH - CH_3 \end{array}$
 (c) $CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - OH$
 (d) $CH_3 - CH_2 - \begin{array}{c} CH \\ | \\ CH_3 \end{array} - CH_2 - CH_2 - OH$

1. In the given conformation C_2 is rotated about $C_2 - C_3$ bond anticlockwise by an angle of 120° then the conformation obtained is [AIIMS 2004]



- (a) Fully eclipsed conformation
 (b) Partially eclipsed conformation
 (c) Gauche conformation

6. Which of the following statements is not characteristic of free radical chain reaction [IPMER 1997]

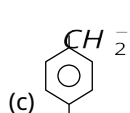
- (a) It gives major product derived from most stable free radical
 (b) It is usually sensitive to change in solvent polarity
 (c) It proceeds in three main steps like initiation, propagation and termination
 (d) It may be initiated by U.V. light

7. Most stable carbanion is [BHU 2003]

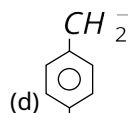
- (a) CH_3^- (b) $CH_3CH_2^-$

Critical Thinking

Objective Questions



NO₂



CH₃

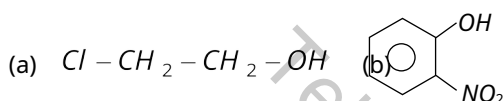
8. Among the following the dissociation constant is highest for

[AIIMS 2004]

- (a) C_6H_5OH (b) $C_6H_5CH_2OH$
(c) $CH_3C \equiv CH$ (d) $CH_3NH_3^+Cl^-$

9. Which one of the following compounds is most acidic

[CBSE PMT 2005]



10. Which one is electrophilic addition [AMU (Engg.) 1999]

- (a) $CH_3-CH_3 + Cl_2 \rightarrow C_2H_5Cl + HCl$
(b) $CH_3CH=O + HCN \rightarrow (CH_3)_2C(OH)CN$
(c) $(CH_3)_2C=O + HCN \rightarrow CH_3CH(OH)CN$
(d) $CH_2=CH_2 + Br_2 \rightarrow CH_2BrCH_2Br$

11. A compound has 3 chiral carbon atoms. The number of possible optical isomers it can have [DCE 2004]

- (a) 3 (b) 2
(c) 8 (d) 4

12. How many chiral isomers can be drawn from 2-bromo, 3-chloro butane [DCE 2003]

- (a) 2 (b) 3
(c) 4 (d) 5

13. Number of isomers of C_4H_{10} is

[CBSE PMT 1996; AFMC 1997; RPMT 2002; MP PMT 1997]

- (a) 2 (b) 3
(c) 4 (d) Isomerism not exist

14. The number of possible isomers for compound $C_2H_3Cl_2Br$ is [MP PMT 1999]

- (a) 2 (b) 3
(c) 4 (d) 5

15. The optically active tartaric acid is named as D-(+)-tartaric acid because it has a positive [IIT-JEE 1999]

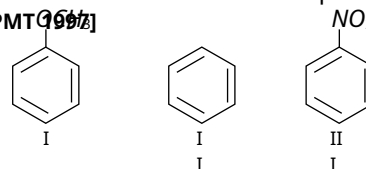
(a) Optical rotation and is derived from D-glucose

(b) pH in organic solvent

(c) Optical rotation and is derived from D(+) glyceraldehyde

(d) Optical rotation only when substituted by deuterium

16. Among the following compounds (I-III) the correct order of reaction with electrophilic reagent is [CBSE PMT 1997]



- (a) II > III > I (b) III < I < II
(c) I > II > III (d) I = II > III

17. Carbocation which is most stable [BHU 2003]

- (a) $CH_3CH_2^+$ (b) CH_3^+
(c) $C_6H_5CH_2^+$ (d) $CH_3CH_2CH_2^+$

18. Tautomerism is exhibited by

[CBSE PMT 1997; KCET 2002]

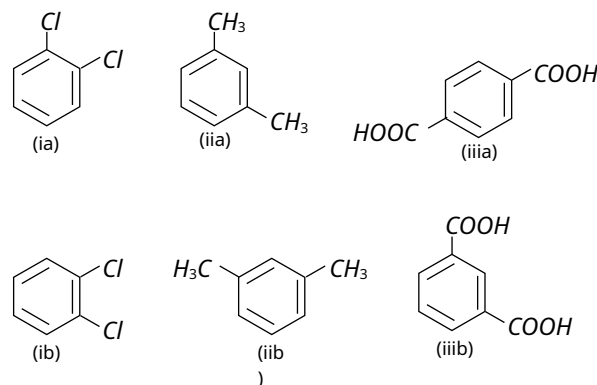
- (a) $(CH_3)_3CNO$ (b) $(CH_3)_2NH$
(c) R_3CNO_2 (d) RCH_2NO_2

19. Which of the following will have geometrical isomers

[MP PET 1996; MP PMT 1997; AFMC 1997]

- (a) 2-methylpropene (b) 2-butene
(c) 1-butene (d) Propene

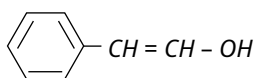
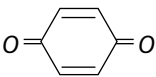
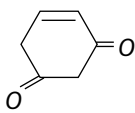
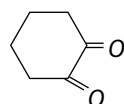
20. Examine the following three pairs of possible isomers



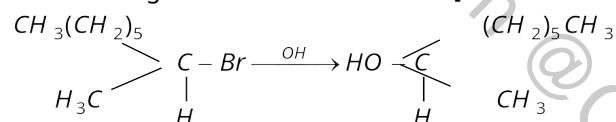
Now state whether the pairs represent identical compounds or different isomers

- (a) All three pairs represent different compounds
 (b) (ia) and (ib) are identical; (iia) and (iib) are identical; and (iia) and (iib) are identical
 (c) (ia) and (ib) are isomers; (iia) and (iib) are identical; and (iia) and (iib) are isomers
 (d) (ia) and (ib) are identical; (iia) and (iib) are identical, and (iia) and (iib) are isomers

21. Tautomerism is exhibited by [IIT-JEE 1998]

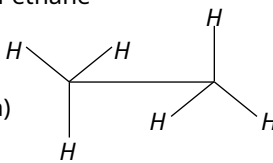
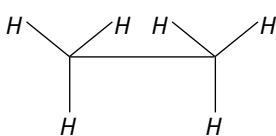
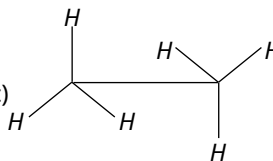
- (a) 
 (b) 
 (c) 
 (d) 

22. The following reaction is described as [CBSE PMT 1997]

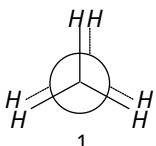
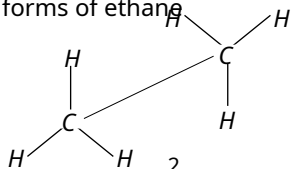
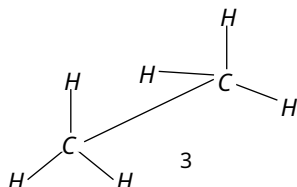
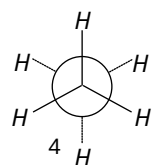


- (a) SE^2 (b) SN^1
 (c) SN^2 (d) SN^0

23. Which one of the following represents eclipsed form of ethane

- (a)  (b) 
 (c)  (d) None of these

24. Which are the staggered forms of ethane

- 1  2 
 3  4 

- (a) 1 and 4 (b) 3 and 4
 (c) 2 and 4 (d) 1 and 3

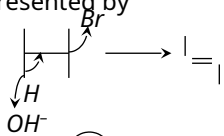
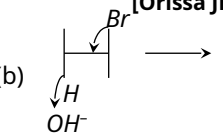
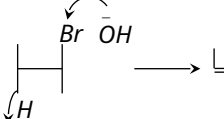
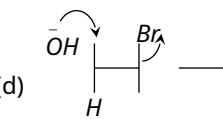
25. Which of the following is the most stable cation [CBSE PMT 1988; MNR 1988; AIIMS 1985]

- (a) $\text{CH}_3\text{CH}_2\text{C}^+\text{HCH}_3$ (b) $\text{CH}_3 - \text{C}^+(\text{CH}_3)_2$
 (c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{C}^+\text{H}_2$ (d) CH_3^+

26. In a reaction of $\text{C}_6\text{H}_5\text{Y}$, the major product (> 60%) is *m*-isomer, so the group Y is [AIIMS 1997; UPSEAT 2003]

- (a) $-\text{COOH}$ (b) $-\text{NH}_2$
 (c) $-\text{OH}$ (d) $-\text{Cl}$


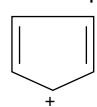


27. Dehydrohalogenation in presence of OH^- is correctly represented by [Orissa JEE 2004]

- (a)  (b) 
 (c)  (d) 

28. Number of structural isomers of $\text{C}_4\text{H}_{10}\text{O}$ are [CPMT 1983, 84, 89, 91; MADT Bihar 1984; MNR 1984; MP PET 1997; Pb. PMT 1999; MH CET 2003]

- (a) 3 (b) 6
 (c) 7 (d) 10

29. Among the following the aromatic compound is [AIIMS 2004]

- (a)  (b) 
 (c)  (d) 

30. Which of the following compounds are not arranged in order of decreasing reactivity towards electrophilic substitution [DCE 2003]

- (a) Fluoro benzene > chloro benzene > bromo benzene
 (b) Phenol > *n*-propyl benzene > benzoic acid
 (c) Chloro toluene > para-nitro toluene > 2-chloro-4-nitro toluene
 (d) Benzoic acid > phenol > *n*-propyl benzene

31. Most stable carbonium ion is [Pb. CET 2004]

- (a) C_2H_5^+ (b) $(\text{CH}_3)_3\text{C}^+$
 (c) $(\text{C}_6\text{H}_5)_3\text{C}^+$ (d) $\text{C}_6\text{H}_5\text{CH}_2^+$

32. Which one of the following species is most stable
[IIT-JEE 1995]

- (a) $p-O_2N-C_6H_4-\overset{+}{C}H_2$
 (b) $p-CH_3O-C_6H_4-\overset{+}{C}H_2$
 (c) $p-Cl-C_6H_4-\overset{+}{C}H_2$
 (d) $C_6H_5-\overset{+}{C}H_2$

33. Which of the following gives most stable carbocation by dehydration
[RPMT 2002]

- (a) $(CH_3)_2CH-OH$
 (b) $(CH_3)_3C-OH$
 (c) CH_3-CH_2-OH
 (d) $CH_3-CH_2-O-CH_2-CH_3$

34. Which of the following orders regarding relative stability of free radicals is correct
[UPSEAT 2004]

- (a) $3^\circ < 2^\circ < 1^\circ$ (b) $3^\circ > 2^\circ > 1^\circ$
 (c) $1^\circ < 2^\circ > 3^\circ$ (d) $3^\circ > 2^\circ < 1^\circ$

35. The +I effect of alkyl groups is in the order
[DCE 2002]

- (a) $2^\circ > 3^\circ > 1^\circ$ (b) $1^\circ > 2^\circ > 3^\circ$
 (c) $3^\circ > 2^\circ > 1^\circ$ (d) None of these

36. Which one has asymmetric C-atom
[Roorkee 1995]

- (a) $CH_3-CH_2-CH_2$
 (b) $CH_3-\underset{\substack{| \\ Br}}{CH}-CH-\underset{\substack{| \\ CH_3}}{CH}-CH_3$
 (c) $CH_3-CH_2-\underset{\substack{| \\ Br}}{CH}-CH_3$
 (d) $CH_3-\underset{\substack{| \\ Br}}{C}(CH_3)-CH_2-CH_2-CH_3$

37. Which of the following compounds will show metamerism
[KCET 1996]

- (a) $CH_3COOC_2H_5$ (b) $C_2H_5-S-C_2H_5$
 (c) CH_3-O-CH_3 (d) $CH_3-O-C_2H_5$

38. How many carbon atoms in the molecule $HCOO-(CHOH)_2-COOH$ are asymmetric
[MP PET 2001]

- (a) 1 (b) 2
 (c) 3 (d) None of these

39. Which of the following act as nucleophiles
[Roorkee 1999]

- (a) CH_3NH_2 (b) RO^-
 (c) $AlCl_3$ (d) CH_3MgBr

40. Which of the following has the highest nucleophilicity
[IIT-JEE Screening 2000]

- (a) F^- (b) OH^-
 (c) CH_3^- (d) NH_2^-

41. Keto-enol tautomerism is found in
[IIT-JEE 1988; MADT Bihar 1995]

- (a) $H_5C_6-\overset{\overset{O}{||}}{C}-H$
 (b) $H_5C_6-\overset{\overset{O}{||}}{C}-C_6H_5$
 (c) $H_5C_6-\overset{\overset{O}{||}}{C}-CH_3$
 (d) $H_5C_6-\overset{\overset{O}{||}}{C}-CH_2-\overset{\overset{O}{||}}{C}-CH_3$

42. Which of the following compounds will show geometrical isomerism
[IIT-JEE 1998]

- (a) 2-butene (b) Propene
 (c) 1-phenylpropene (d) 2-methyl-2-butene

43. Which behaves both as a nucleophile and electrophile
[IIT-JEE Screening 1991; Pb. CET 1985]

- (a) CH_3NH_2 (b) CH_3Cl
 (c) CH_3CN (d) CH_3OH

44. The number of optical isomers of an organic compound having n asymmetric carbon atoms will be
[MP PET 1994]

- (a) 2^{n+1} (b) n^2
 (c) 2^n (d) 2^{n-1}

45. Total number of isomers of C_6H_{14} are
[IIT-JEE 1987; DPMT 1983; CPMT 1991; MNR 1990; MP PET 1995; UPSEAT 2001]

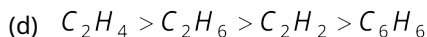
- (a) 4 (b) 5
 (c) 6 (d) 7

46. With a change in hybridisation of the carbon bearing the charge, the stability of a carbanion increase in the order
[DCE 2003]

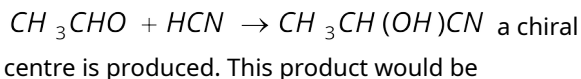
- (a) $sp < sp^2 < sp^3$ (b) $sp < sp^3 < sp^2$
 (c) $sp^3 < sp^2 < sp$ (d) $sp^2 < sp < sp^3$

47. The C - C bond length of the following molecules is in the order
[IIT-JEE 1991]

- (a) $C_2H_6 > C_2H_4 > C_6H_6 > C_2H_2$
 (b) $C_2H_2 < C_2H_4 < C_6H_6 < C_2H_6$
 (c) $C_2H_6 > C_2H_2 > C_6H_6 > C_2H_4$



48. In the reaction



[CBSE PMT 1995]

- (a) Laevorotatory (b) Meso compound
(c) Dextrorotatory (d) Racemic mixture

49. Cyclic hydrocarbon molecule 'A' has all the carbon and hydrogen in a single plane. All the carbon-carbon bonds are of same length less than 1.54\AA , but more than 1.34\AA . The $C-C$ bond angle will be [BVP 2003]

- (a) $109^\circ 28'$ (b) 100°
(c) 180° (d) 120°

50. How many structural isomers are possible for a compound with molecular formula C_3H_7Cl [CBSE PMT 2001]

- (a) 2 (b) 5
(c) 7 (d) 9



Assertion & Reason

For AIIMS Aspirants

Read the assertion and reason carefully to mark the correct option out of the options given below:

- (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
(c) If assertion is true but reason is false.
(d) If the assertion and reason both are false.
(e) If assertion is false but reason is true.

1. Assertion : Aniline is better nucleophile than anilium ion.

Reason : Anilium ion have +ve charge. [AIIMS 1996]

2. Assertion : Neopentane forms one mono substituted compound.

Reason : Neopentane is isomer of pentane.

[AIIMS 2001]

3. Assertion : *Trans*-2-butene on reaction with Br_2 gives *meso*-2, 3-dibromobutane.

Reason : The reaction involves syn-addition of bromine.

[AIIMS 2003]

4. Assertion : *Cis*-1, 3-dihydroxy cyclohexane exists in boat conformation.

Reason : In the chair form, there will not be hydrogen bonding between the two hydroxyl groups.

[AIIMS 2003]

5. Assertion : Hydroxyketones are not directly used in Grignard reaction.

Reason : Grignard reagents react with hydroxyl group.

[AIIMS 2003]

6. Assertion : Benzyl bromide when kept in acetone water it produces benzyl alcohol.

Reason : The reaction follows SN^2 mechanism.

[AIIMS 2003]

7. Assertion : Carbon possesses property of catenation.

Reason : Carbon atoms form double as well as triple bonds during catenation.

8. Assertion : Olefins have the general formula C_nH_{2n+1} .

Reason : There is one double bond between two carbon atoms in their molecules.

9. Assertion : Saturated hydrocarbons are chemically less reactive.

Reason : All isomeric paraffins have same parent name.

10. Assertion : A mixture of glucose and *m*-dinitrobenzene can be separated by shaking it with ether.

Reason : Glucose is soluble in water.

11. Assertion : Tertiary carbonium ions are generally formed more easily than primary carbonium ions.

Reason : Hyperconjugative as well as inductive effect due to additional alkyl groups stabilize tertiary carbonium ions.

12. Assertion : Heterolytic fission involves the breaking of a covalent bond in such a way that both the electrons of the shared pair are carried away by one of the atoms.

Reason : Heterolytic fission occurs readily in polar covalent bonds.

13. Assertion : The order of reactivity of carbonium ions is $2^\circ > 3^\circ > 1^\circ$.

Reason : Carbon atom in carbonium ions is in sp^3 state of hybridisation.

14. Assertion : Free radicals are short lived and highly reactive.

Reason : Free radicals are highly unstable.

15. Assertion : Each carbon in ethylene molecule is sp^2 hybridised.

Reason : The $H - C - H$ bond angle in ethylene molecule is 120° .

16. Assertion : Cyclohexanone exhibits keto-enol tautomerism.

Reason : In cyclohexanone, one form contains the keto group ($C = O$) while other contains enolic group ($-C = C - OH$).

17. Assertion : Staggered form is less stable than the eclipsed form.

Reason : The conformation in which the bond pairs of two central atoms are very far from one another is called staggered form.

18. Assertion : *Trans* isomers are more stable than *cis* isomer.

Reason : The *cis* isomer is the one in which two similar groups are on the same side of double bond.

19. Assertion : Propadiene is optically active.

Reason : Propadiene has a plane of symmetry.

20. Assertion : Lactic acid is optically active.

Reason : A symmetry in the inner structure of the organic compound causes optical activity.

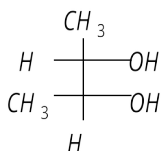
21. Assertion : Same number of electron pairs are present in resonance structures.

Reason : Resonance structures differ in the location of electrons around the constituent atoms.

22. Assertion : Carbon-oxygen bonds are of equal length in carbonate ion.

Reason : Bond length decreases with the multiplicity of bond between two atoms.

- The most stable conformation of *n*-butane is
[CBSE PMT 1997]
(a) Skew boat (b) Eclipsed
(c) Gauche (d) Staggered
- Which of the following undergoes nucleophilic substitution by S_N^1 mechanism [CBSE PMT 2005]
(a) Benzyl chloride (b) Ethyl chloride
(c) Chlorobenzene (d) Isopropyl chloride
- Which type of isomerism is shown by propanal and propanone [CPMT 2004]
(a) Functional group (b) Metamerism
(c) Tautomerism (d) Chain isomerism
- Which of the following exhibits optical isomerism [BHU 1980; NCERT 1983; AIIMS 1992; MNR 1993; MP PMT 1990, 94]
(a) Butanol-1 (b) Butanol-2
(c) Butene-1 (d) Butene-2
- In carbonium ion the carbon bearing the positive charge in the [Pb. PMT 1999; MH CET 2002]
(a) sp^2 -hybridized state (b) sp^3d -hybridized state
(c) sp -hybridized state (d) sp^3 -hybridized state
- Which of the following is not an electrophile [CBSE PMT 2001]
(a) Cl^+ (b) Na^+
(c) H^+ (d) BF_3
- Heterolytic bond dissociation energy of alkyl halides follows the sequence [AMU 2000]
(a) $R-F > R-Cl > R-Br > R-I$
(b) $R-I > R-Br > R-Cl > R-F$
(c) $R-I > R-F > R-Br > R-Cl$
(d) $R-Cl > R-Br > R-I > R-F$
- The shape of carbonium is [AMU (Engg.) 1999]
(a) Planar (b) Pyramidal
(c) Linear (d) None of these
- Which of the following compounds shows tautomerism [MP PET 2001]
(a) $HCHO$ (b) CH_3CHO
(c) CH_3COCH_3 (d) $HCOOH$
- In which bond angle is the highest [CBSE PMT 1991]
(a) sp^3 (b) sp^2
(c) sp (d) sp^3d
- How many primary amines are possible for the formula $C_4H_{11}N$ [MNR 1995]
(a) 1 (b) 2
(c) 3 (d) 4
- On monochlorination of 2-methyl butane, the total number of chiral compounds is [IIT-JEE Screening 2004]
(a) 2 (b) 4
(c) 6 (d) 8
- An isomer of ethanol is [DPMT 1982, 88; CPMT 1973, 75, 78, 84; IIT-JEE 1986; BHU 1984, 85; EAMCET 1993; MP PET 1995; RPET 1999; BHU 2000; AFMC 2002]
(a) Methanol (b) Dimethyl ether
(c) Diethyl ether (d) Ethylene glycol
- Due to the presence of an unpaired electron, free radicals are [AIEEE 2005]
(a) Chemically reactive (b) Chemically inactive
(c) Anions (d) Cations
- Tertiary alkyl halides are practically inert to substitution by S_N^2 mechanism because of [AIEEE 2005]
(a) Insolubility (b) Instability
(c) Inductive effect (d) Steric hindrance
- The decreasing order of nucleophilicity among the nucleophiles
(i) $CH_3\overset{\overset{O}{||}}{C}-O^-$ (ii) CH_3O^-
(iii) CN^- (iv) $H_3C-\text{C}_6\text{H}_5-\overset{\overset{O}{||}}{\underset{\underset{O}{||}}{S}}-O^-$
is [AIEEE 2005]
(a) (i), (ii), (iii), (iv) (b) (iv), (iii), (ii), (i)
(c) (ii), (iii), (i), (iv) (d) (iii), (ii), (i), (iv)
- Which of the following is optically active [BHU 2005]
(a) Butane (b) 4-methylheptane
(c) 3-methylheptane (d) 2-methylheptane
- Correct configuration of the following is



[AIIMS 2005]

- (a) 1S, 2S (b) 1S, 2R
(c) 1R, 2S (d) 1R, 2R

19. Which types of isomerism is shown by 2, 3-dichlorobutane

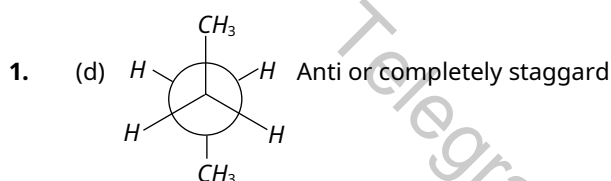
- (a) Distereo (b) Optical
(c) Geometric (d) Structural

20. Who synthesised the first organic compound urea in the laboratory [RPMT 2000]

- (a) Kolbe (b) Wohler
(c) Fraizer (d) Berzilius

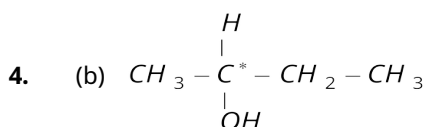
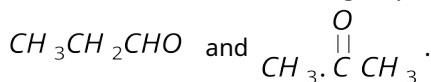
AS Answers and Solutions

(SET -23)



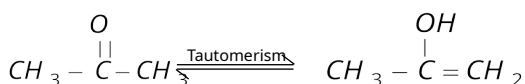
Staggered form is most stable because of minimum repulsion between bulky methyl groups.

2. (a) Due to more stable carbocation.
3. (a) When two compounds have similar molecular formula but differ in the functional group then the isomerism is called functional group isomerism i.e.



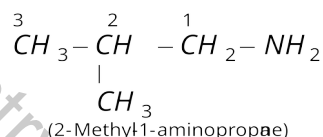
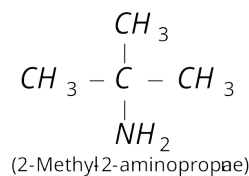
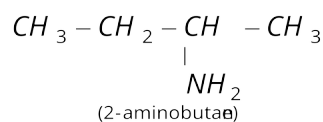
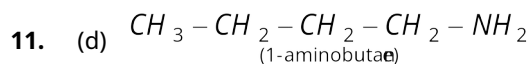
Because it has chiral carbon atom.

5. (a) The central carbon atom in carbonium ion is sp^2 hybridised and it has three sp^2 hybrid orbitals for single bonding to three substituents.
6. (b) Na^+ is not an electrophile.
7. (b) $R-I > R-Br > R-Cl > R-F$
8. (a) Carbonium ion is planar species
9. (c) Ketones show tautomerism. They form keto and enol form

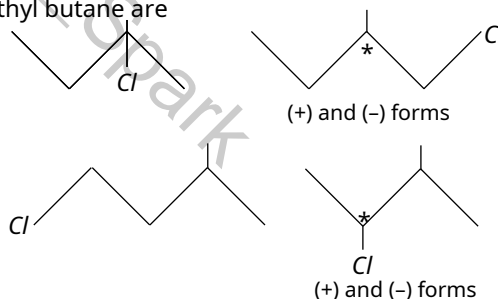


10. (c) Type Bond angle
 sp^3 109.5°
 sp^2 120°
 sp^3d 90° and 120°

sp 180°



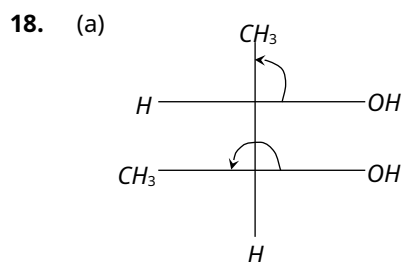
12. (b) The possible monochlorinated products of 2-methyl butane are



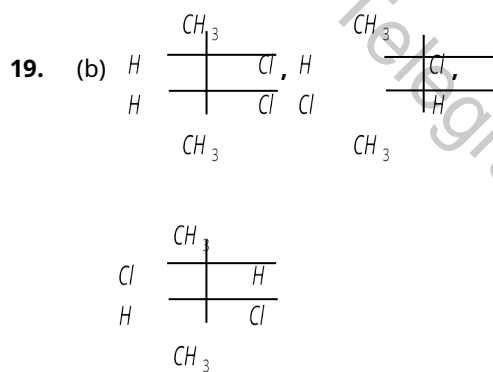
Therefore, a total of four chiral compounds are obtained.

13. (b) Dimethyl ether is an isomer of ethanol.
14. (a) Free radicals are very reactive due to the presence of free e^- .
15. (d) Due to steric hindrance
16. (c) (ii) > (iii) > (i) > (iv)

17. (c) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{CH}_2\text{CH}^*\text{CHCH}_2\text{CH}_2\text{CH}_3 \end{array}$ has a chiral carbon atom and hence is optically active.



Following the procedure outlined under 'Golden Rule' the absolute configuration is 1s, 2s.



20. (b) Wohler synthesised the first organic compound urea in the laboratory.

- The maximum number of isomers for an alkene with the molecular formula C_4H_8 is
(a) Two (b) Three (c) Four (d) Five
- The number of structural and configurational isomers of a bromo compound, C_5H_9Br , formed by the addition of HBr to 2-pentyne respectively are
(a) 1 and 2 (b) 2 and 4 (c) 4 and 2 (d) 2 and 1
- Which of the following is an optically active compound?
(a) 1-Butanol (b) 1-Propanol
(c) 2-Chlorobutane (d) 4-Hydroxyheptane
- Which of the following will have least hindered rotation about carbon-carbon bond?
(a) Ethane (b) Ethylene (c) Acetylene (d) Hexachloroethane
- An organic molecule necessarily shows optical activity if it
(a) contains asymmetric carbon atoms
(b) is non-polar
(c) is non-superimposable on its mirror image
(d) is superimposable on its mirror image.

- The stability of the compounds



(i)



(ii)



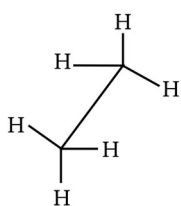
(iii)



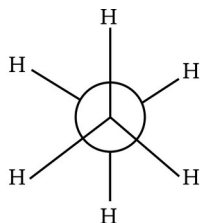
(iv)

- (iv) > (iii) > (i) > (ii)
 - (i) > (iii) > (ii) > (iv)
 - (ii) > (iii) > (i) > (iv)
 - (iv) > (i) > (iii) > (ii)
- How many structural isomers are there of $C_4H_{10}O$ that are ethers?
(a) 1 (b) 3 (c) 2 (d) 4

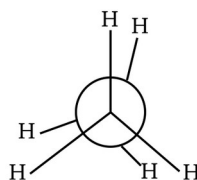
- In the following structures, which two forms are staggered conformation of ethane?



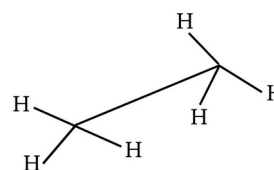
(1)



(2)



(3)

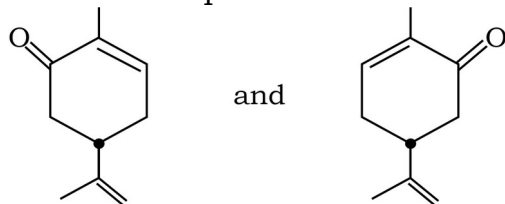


(4)

- 1 and 4
 - 2 and 3
 - 1 and 2
 - 1 and 3
- The most stable conformation of ethylene glycol is
(a) Anti (b) Gauche (c) Partially eclipsed (d) Fully eclipsed

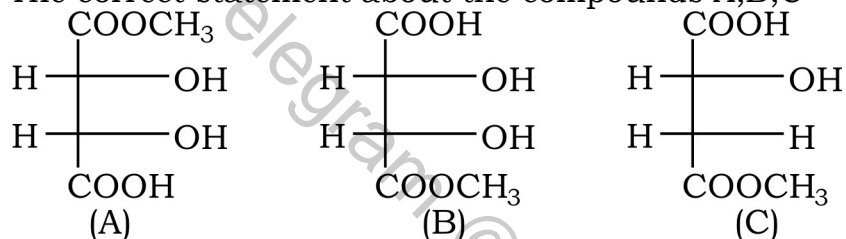
10. Which of the following has zero dipole moment ?
(a) cis -2-Butene (b) trans -2-Butene
(c) 1-Butene (d) 2-Methyl-1-propene

11. The two compounds shown in the figure below are



- (a) Diastereomers (b) Enantiomers
(c) Epimers (d) Regiomers

12. The correct statement about the compounds A,B,C

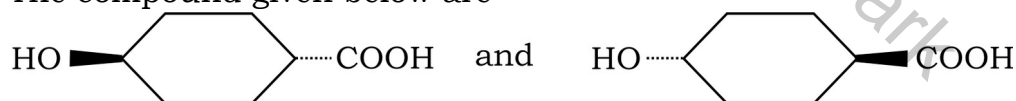


- (a) A and B are identical (b) A and B are diastereomers
(c) A and C are enantiomers (d) A and B are enantiomers

13. The isomers which can be converted into another form by rotation of the molecule around single bond are

- (a) Geometrical isomers (b) Conformers
(c) Enantiomers (d) Diastereomers

14. The compound given below are



- (a) Enantiomers (b) Identical
(c) Regiomers (d) Diastereomers

15. Which of the following compound is not chiral

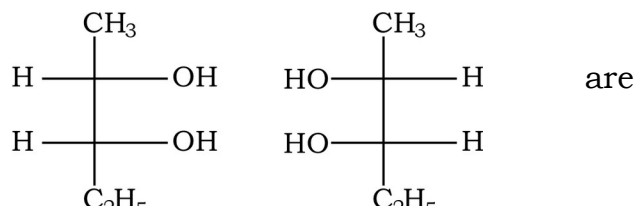
- (a) $\text{DCH}_2\text{CH}_2\text{CH}_2\text{Cl}$ (b) $\text{CH}_3\text{CHDCH}_2\text{Cl}$
(c) $\text{CH}_3\text{CHClCH}_2\text{D}$ (d) $\text{CH}_3\text{CH}_2\text{CHDCl}$

16. The optically active tartaric acid is named as D-(+) – tartaric acid because it has a positive

- (a) Optical rotation and is derived from D-glucose
(b) pH in organic solvent

- (c) Optical rotation and is derived from D-(+)- glyceraldehyde
 (d) Optical rotation only when substituted by deuterium.

17. The following two compounds are

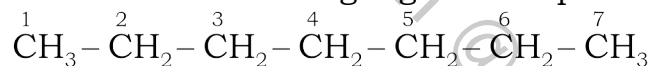


- (a) Enantiomers (b) Diastereomers
 (c) Identical (d) Epimers.

18. But-2-ene exhibits cis-trans- isomerism due to

- (a) rotation around C₃-C₄ sigma bond
 (b) restricted rotation around C=C bond
 (c) rotation around C₁-C₂ bond
 (d) rotation around C₂-C₃ double bond.

19. Consider the following organic compound,



To make it a chiral compound, the attack should be on carbon

- (a) 1 (b) 3 (c) 4 (d) 7

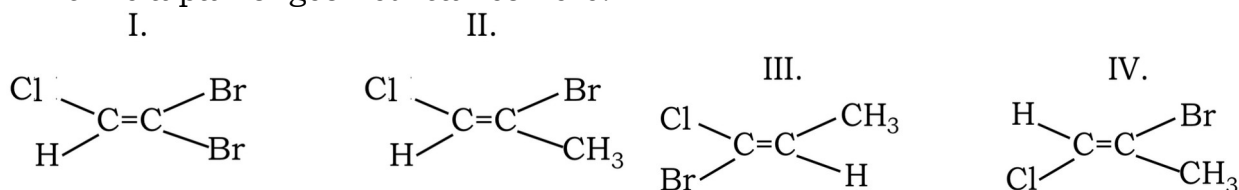
20. The number of ether metamers represented by the formula C₄H₁₀O is

- (a) 4 (b) 3 (c) 2 (d) 1

21. Which of the following has the lowest dipole moment ?

- (a) $\begin{array}{c} \text{CH}_3 \quad \text{CH}_3 \\ \diagdown \quad \diagup \\ \text{C} = \text{C} \\ \diagup \quad \diagdown \\ \text{H} \quad \text{Br} \end{array}$ (b) CH₃-C≡C-CH₃
 (c) CH₃CH₂C≡CH (d) CH₂=CH-C≡CH

22. Which is a pair of geometrical isomers?

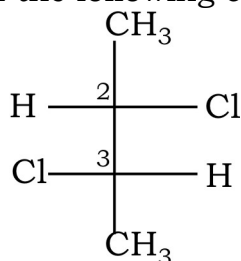


- (a) I and II (b) I and III (c) II and IV (d) III and IV

23. Which of the following does not show geometrical isomerism?

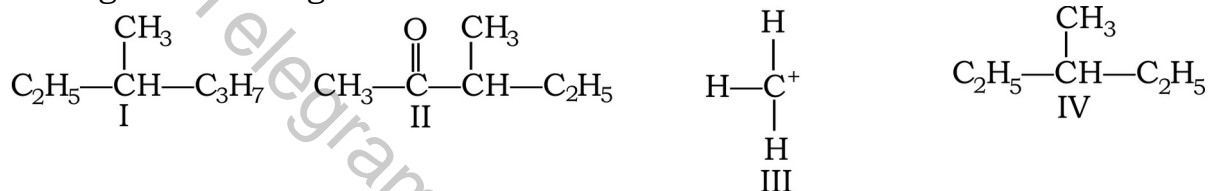
- (a) 1, 2-dichloro-1-pentene (b) 1, 3-dichloro-2-pentene
(c) 1, 1-dichloro-1-pentene (d) 1, 4-dichloro-2-pentene

24. The absolute configuration of the following compound is



- (a) 2 S, 3 R (b) 2 S, 3 S (c) 2 R, 3 S (d) 2 R, 3 R

25. Among the following four structures I to IV

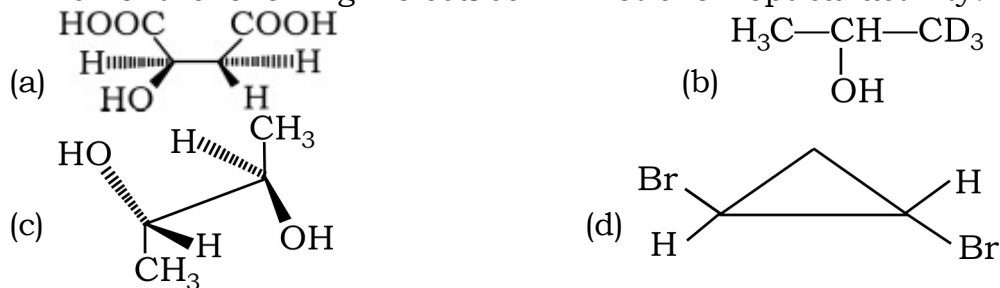


It is true that

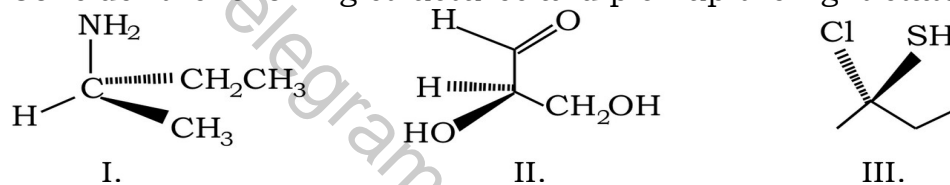
- (a) Only II and IV are chiral compounds
(b) All four are chiral compounds
(c) Only I and II are chiral compounds
(d) Only III is a chiral compound
26. The total number of acyclic and cyclic isomers including stereoisomers possible for the molecular formula, C_5H_{10} is
(a) 10 (b) 8 (c) 9 (d) 12
27. Which of the following shows geometrical isomerism ?
(a) $\text{CH}_3\text{CH} \begin{array}{l} \nearrow \text{CO-NH} \\ \searrow \text{NH-CO} \end{array} \text{CHCH}_3$ (b) 1,2-Dimethylcyclopropane
(c) 1, 2-Dichloroethene (d) All the three
28. Enantiomers have
(a) identical m.p/b.p but different refractive indices
(b) identical m.p/b.p and refractive indices but rotate plane polarized light in opposite directions but to the same extent
(c) different refractive indices and rotate plane polarized light in the same direction but to different extents
(d) different m.p/b.p. but rotate plane of polarized light in different directions but to the same extents
29. Which of the following statements is correct?
(a) The presence of chiral carbon is an essential condition for enantiomerism

- (b) Functional isomerism is a kind of stereoisomerism
 (c) Diastereomers are always optically active
 (d) Compounds containing one chiral carbon atom are always optically active

30. Which of the following molecules will not show optical activity?



31. Consider the following structures and pick up the right statement

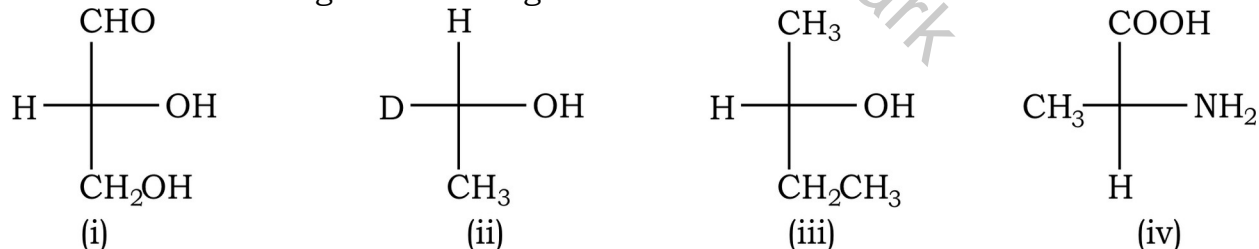


- (a) I and II have R-configuration
 (b) I and III have R-configuration
 (c) Only III has S-configuration
 (d) Both (a) and (c) are correct.

32. The IUPAC name of is

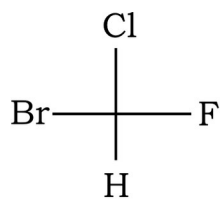
- (a) (Z)-4,6-Dimethyloct-4-en-3-one
 (b) (E)-4,6-Dimethyloct-4-en-3-one
 (c) (Z)-3,5-Dimethyloct-4-en-6-one
 (d) (E)-3,5-Dimethyloct-4-en-6-one

33. The R-isomer among the following are:

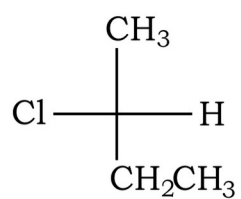


- (a) (i) and (ii) (b) (i) and (iii) (c) (ii) and (iii) (d) (iii) and (iv)

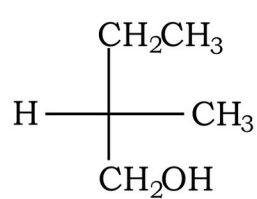
34. Select the isomer from the following



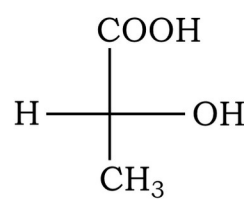
(a)



(b)

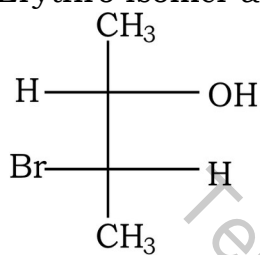


(c)

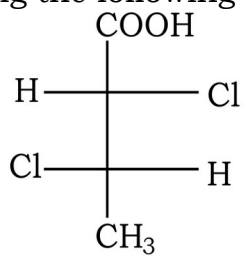


(d)

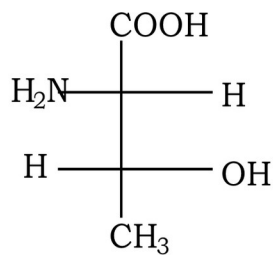
35. Erythro isomer among the following is



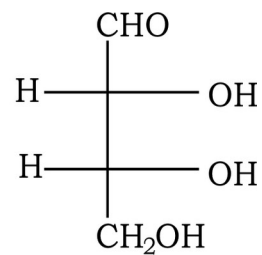
(a)



(b)



(c)



(d)

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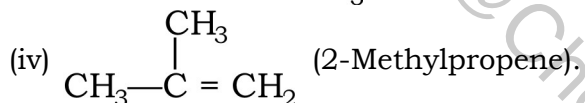
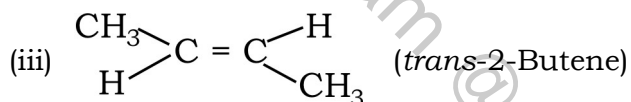
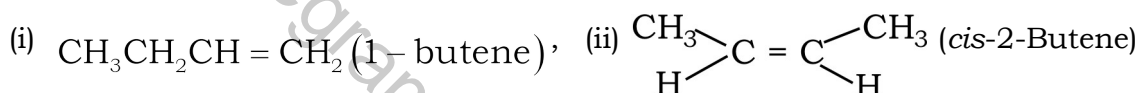
General Organic Chemistry

Answer Key

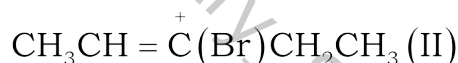
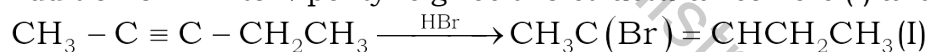
Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.
1.	C	11.	B	21.	B	31.	A
2.	B	12.	D	22.	C	32.	A
3.	C	13.	B	23.	C	33.	A
4.	A	14.	B	24.	B	34.	C
5.	C	15.	A	25.	C	35.	D
6.	A	16.	C	26.	D		
7.	B	17.	A	27.	D		
8.	C	18.	B	28.	B		
9.	B	19.	B	29.	D		
10.	B	20.	B	30.	C		

Solution : -

1. Four alkenes:



2. Addition of HBr to 2-pentyne gives two structural isomers (I) and (II)



Each one of these will exist as a pair of geometrical isomers.

Thus, there are two structural and four configurational isomers

3. 2-chlorobutane contains a chiral carbon and hence is optically active

4. Because of the bigger size of Cl than H, the rotation about carbon-carbon single bond in hexa chloroethane is more hindered than, in ethane or the other hand because of the presence of double bond in ethylene, and triple bond in acetylene, the rotation about carbon-carbon bond is highly hindered, Thus ethane has the least hindered rotation.

5. Non-superimposable on its mirror image.

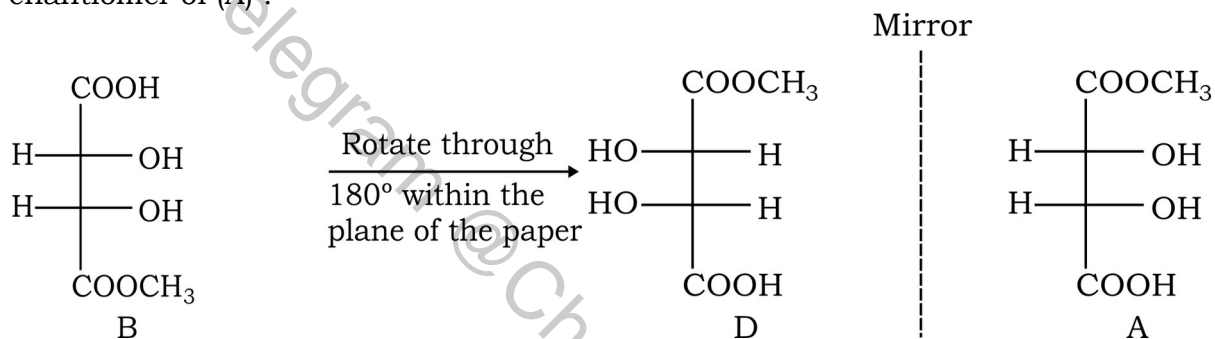
6. Cyclohexane (iv) is non-planar and has chair conformation. In this conformation, the $\angle\text{CCC}$ bond angle are the normal tetrahedral angles ($109^\circ-28'$) and thus has no angle strain and hence is the most stable. The rest of the molecules are nearly planar and hence their stability depends upon the angle strain in accordance with Baeyer's strain theory. Since cyclopropane has higher angle strain ($24^\circ - 44'$) than cyclopentane ($0^\circ - 44'$), therefore, cyclopentane (iii) is more stable than cyclopropane (ii). Further,

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because of the presence of a double bond in a three-membered ring, cyclopropene (ii) is the least stable. Thus, the order of stability is (iv) > (iii) > (i) > (ii).

7. Three, These are : $\text{CH}_3\text{OCH}_2\text{CH}_2\text{CH}_3$, $\text{CH}_3\text{-O-CH}(\text{CH}_3)_2$ and $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$.
8. 1 and 2 represent staggered conformation.
9. Try Your Self
10. trans-2-Butene has zero dipole moment.
11. The two compounds are non-superimposable mirror images of each other and hence are enantiomers.
12. Rotation of B through 180° within the plane of the paper gives D which is an enantiomer of (A).



Thus, A and B are enantiomers.

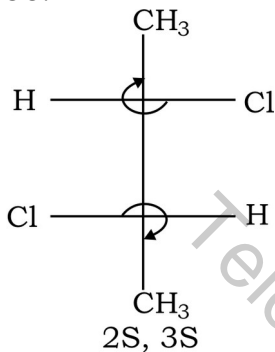
13. Conformers.
14. The two compounds are identical since they have a plane of symmetry.
15. Only $\text{DCH}_2\text{CH}_2\text{CH}_2\text{Cl}$ does not contain a chiral carbon and hence it is not chiral
16. The configuration of the penultimate carbon of any optically active compound is always correlated with D (+)-glyceraldehyde. Therefore, option (c) is correct.
17. The two compounds are non-superimposable mirror images of each other and hence are enantiomers.
18. Restricted rotation around C=C bond .
19. Putting a substituent at position 3 will make the molecule chiral

$$\begin{array}{cccccccc}
 1 & 2 & 3^* & 4 & 5 & 6 & 7 \\
 \text{CH}_3 & -\text{CH}_2- & \text{CH}- & \text{CH}_2- & \text{CH}_2- & \text{CH}_2- & \text{CH}_3 \\
 & & | & & & & \\
 & & \text{X} & & & &
 \end{array}$$
20. Three: $\text{CH}_3\text{OCH}_2\text{CH}_2\text{CH}_3$, $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$, $\text{CH}_3\text{OCH}(\text{CH}_3)_2$
21. $\text{CH}_3\text{-C}\equiv\text{C-CH}_3$ being linear as well as symmetrical, has lowest dipole moment.
22. II and IV and cis-trans-isomers

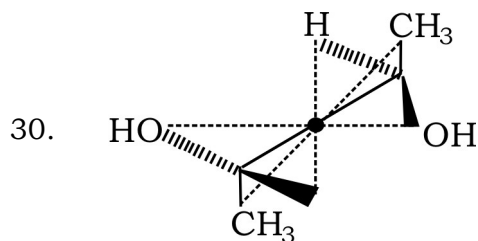
23. 1,1-Dichloro-1-pentene

$\begin{array}{c} \text{Cl} \\ \diagdown \\ \text{C} = \text{CHCH}_2\text{CH}_2\text{CH}_3 \\ \diagup \\ \text{Cl} \end{array}$
 does not show geometrical isomerism since it has two identical atoms i.e. Cl on C₁.

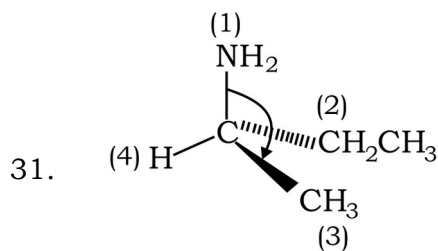
24. Following the procedure outlined under 'Golden Rule' the absolute configuration is 2S, 3S.



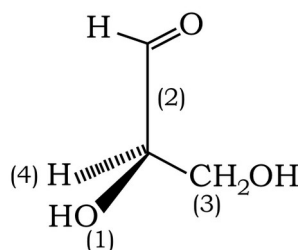
25. I and II contain C-atoms and hence are chiral compounds
26. Try Your Self.
27. Disubstituted cyclic compounds and disubstituted alkenes show geometrical isomerism. Therefore, option (d) correct.
28. Enantiomers have same m.p./b.p and refractive indices but rotate plane polarized light in opposite directions but to the same extent.
29. Compounds possessing one chiral carbon atom are always optically active.



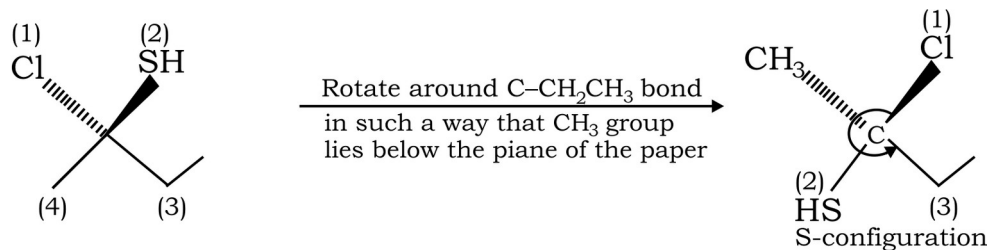
(c) has a centre of symmetry and hence is optically inactive .



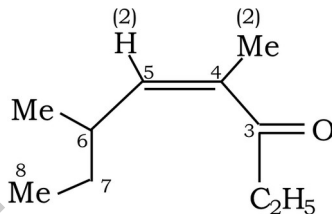
R-configuration



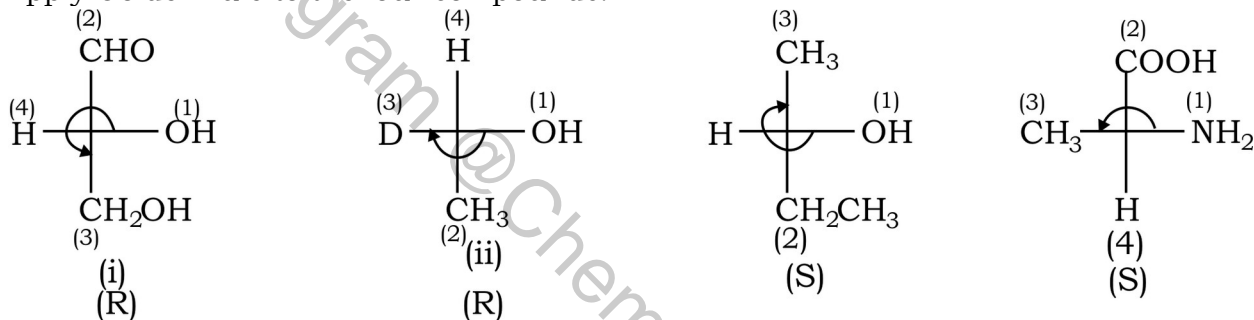
R-configuration



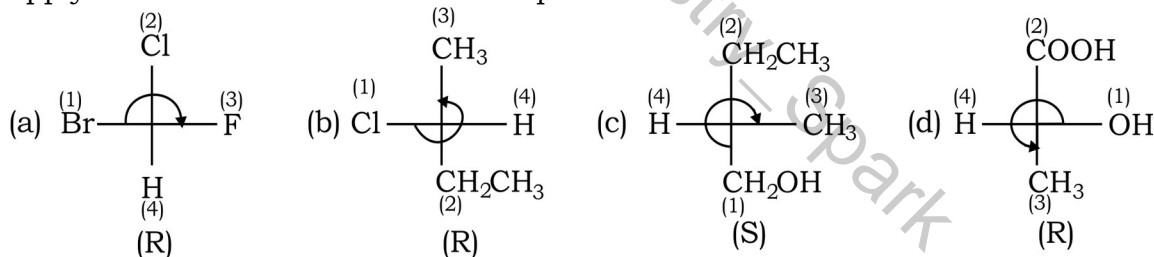
32. The configuration about the double bond is Z and hence the correct name is (Z)-4, 6-dimethyloct-4-en-3-one.



33. Apply Golden rule to the four compounds.



34. Apply Golden rule to all the four compounds.

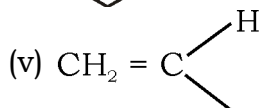
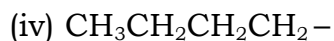
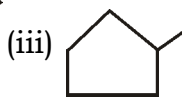
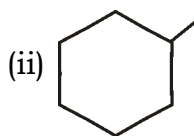
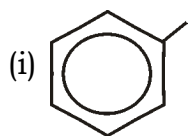


35. In compound (d), the two identical atoms (H,H) or groups (OH,OH) lie on the same side of the Fischer projection formula and hence it represents the erythro isomer.

GENERAL ORGANIC CHEMISTRY EX- 2
MULTIPLE CHOICE QUESTIONS

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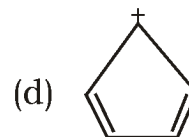
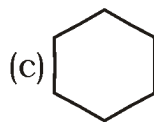
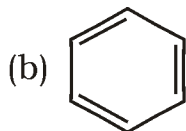
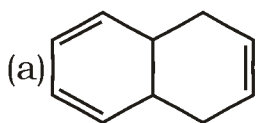
-
1. Which of the following contains three pairs of electrons in the valence shell ?
(a) Carbocations (b) Carbanions
(c) Free radicals (d) None.
2. The formation of cyanohydrin from a ketone is an example of
(a) Electrophilic addition (b) Nucleophilic addition
(c) Nucleophilic substitution (d) Electrophilic substitution
3. The compound in which C uses only its sp^3 - hybrid orbitals for bond formation is
(a) $HCOOH$ (b) $(H_2N)_2CO$ (c) $(CH_3)_3COH$ (d) CH_3CHO
4. The shortest C-C bond distance is found in
(a) Diamond (b) Ethane (c) Benzene (d) Acetylene
5. Homolytic fission of C-C bond in ethane gives an intermediate in which carbon is
(a) sp^3 -hybridised (b) sp^2 -hybridised
(c) sp -hybridised (d) sp^2d - hybridised
6. Which is the correct symbol relating the two Kekule structures of benzene?
(a) \square (b) \rightarrow (c) \equiv (d) \longleftrightarrow
7. When the hybridization state of carbon atom changes from sp^3 to sp^2 and finally to sp , the angle between the hybridized orbitals
(a) decreases gradually (b) decreases considerably
(c) is not affected (d) increases progressively
8. The kind of delocalization involving sigma bond orbitals is called
(a) Inductive effect (b) Hyperconjugation effect
(c) Electromeric effect (d) Mesomeric effect
9. Examine the following chemical structures to which simple functional groups are often attached.



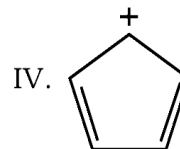
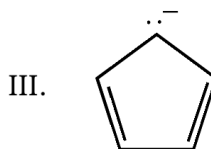
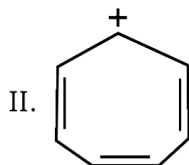
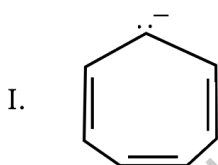
Which of these systems have essentially planar geometry?

- (a) (i) and (v) (b) (ii) and (iii) (c) (ii), (iii) and (iv) (d) (iv)

10. Which of the following will show aromatic behaviour ?
-

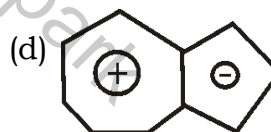
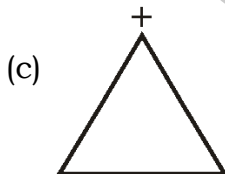
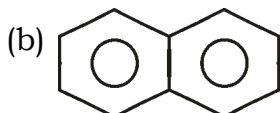
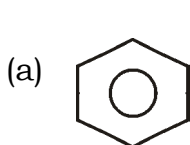


11. Which of the following species would be expected to exhibit aromatic character? Select the correct answer from the following:

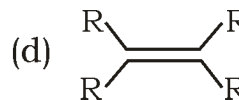
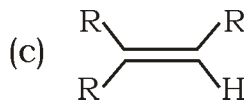
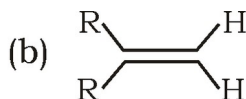
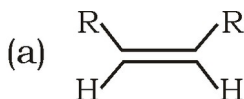


- (a) I and IV (b) II and IV (c) I and III (d) II and III
12. Which of the following is correct regarding the -I-effect of the substituents?
 (a) $-NR_2 < -OR < -F$ (b) $-NR_2 > -OR < -F$
 (c) $-NR_2 < -OR > -F$ (d) $-NR_2 > -OR > -F$
13. In compound, $CH_2=CH-CH_2-CH_2-C\equiv H$, the C_2-C_3 bond is of the type
 (a) $sp-sp^2$ (b) sp^3-sp^3 (c) $sp-sp^3$ (d) sp^2-sp^3
14. The structural formula of a compound is $CH_3-CH=C=CH_2$.
 The types of hybridization at the four carbons from left to right are
 (a) sp^2, sp^2, sp^2, sp^3 (b) sp^2, sp^3, sp^2, sp^2
 (c) sp^3, sp^2, sp, sp^2 (d) sp^3, sp^2, sp^2, sp^2

15. The chemical system that is non aromatic is ?

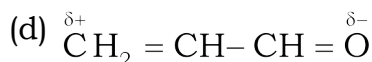
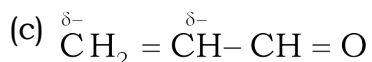


16. Which of the following alkenes will react fastest with H_2 under catalytic hydrogenation conditions?



17. Polarization of electrons in acrolein may be written as

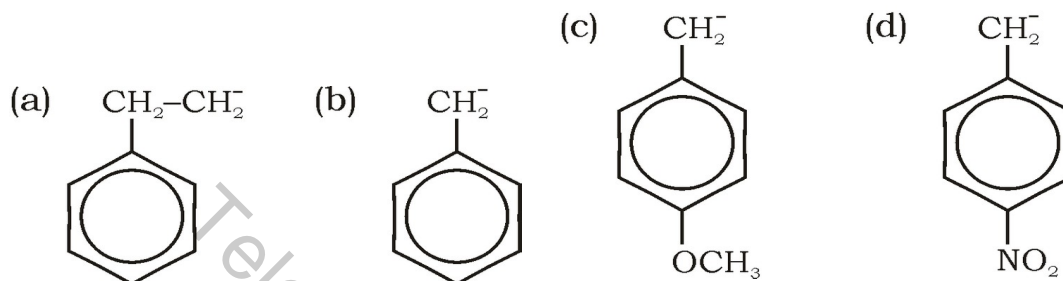




18. Which of the following has the highest nucleophilicity?

- (a) F^- (b) OH^- (c) CH_3^- (d) NH_2^-

19. The most stable carbanion among the following is



20. Nucleophilicity order is correctly represented by

- (a) $\text{CH}_3^- < \text{NH}_2^- < \text{HO}^- < \text{F}^-$ (b) $\text{CH}_3^- \square \text{NH}_2^- > \text{OH}^- \square \text{F}^-$
 (c) $\text{CH}_3^- > \text{NH}_2^- > \text{HO}^- > \text{F}^-$ (d) $\text{NH}_2^- > \text{F}^- > \text{OH}^- > \text{CH}_3^-$

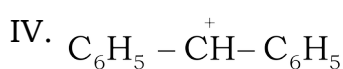
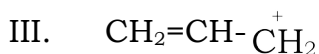
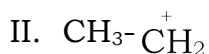
21. The arrangement of $(\text{CH}_3)_3\text{C}-$, $(\text{CH}_2)_2\text{CH}-$, CH_3CH_2- when attached to benzene or an unsaturated group in increasing order of inductive effect is

- (a) $(\text{CH}_3)_3\text{C}- < (\text{CH}_3)_2\text{CH}- < \text{CH}_3\text{CH}_2-$ (b) $\text{CH}_3\text{CH}_2- < (\text{CH}_3)_2\text{CH}- < (\text{CH}_3)_3\text{C}-$
 (c) $(\text{CH}_3)_2\text{CH}- < (\text{CH}_3)_3\text{C}- < \text{CH}_3\text{CH}_2-$ (d) $(\text{CH}_3)_3\text{C}- < \text{CH}_3\text{CH}_2- < (\text{CH}_3)_2\text{CH}-$

22. The reaction, $(\text{CH}_3)_3\text{C}-\text{Br} \xrightarrow{\text{H}_2\text{O}} (\text{CH}_3)_3\text{C}-\text{OH}$ is

- (a) elimination reaction (b) substitution reaction
 (c) free radical reaction (d) addition reaction

23. Consider the following structures



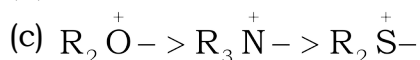
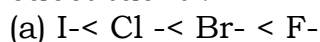
The correct sequence of these carbocations in the decreasing order of their stability is

- (a) IV, III, II, I (b) I, II, III, IV (c) IV, II, III, I (d) I, III, II, IV

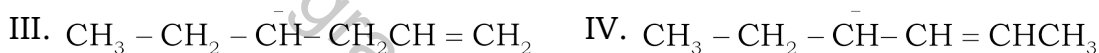
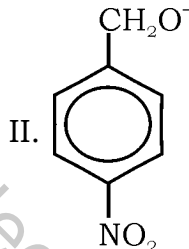
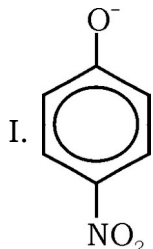
24. The aromaticity of the following heterocycles is in the order

- (a) thiophene > pyrrole > furan > pyridine
 (b) furan > pyrrole > thiophene > pyridine
 (c) pyridine > thiophene > pyrrole > furan
 (d) pyridine > furan > pyrrole > thiophene

25. Which of the following does not represent the correct order of -I-effect of the substituent ?



26. Which of the following anions would be more stable than their corresponding protonated species?



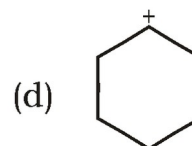
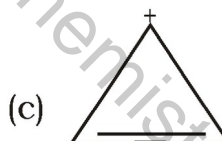
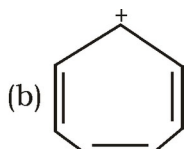
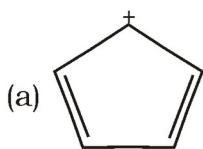
Select the correct answer from the following :

(a) I and IV

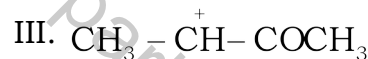
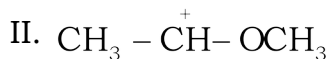
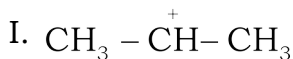
(b) I and III

(c) II and III (d) II and IV

27. The most stable carbocation is



28. Which is the decreasing order of stability of the ions?



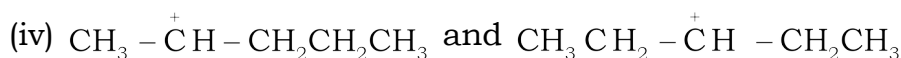
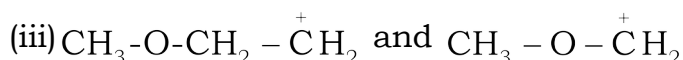
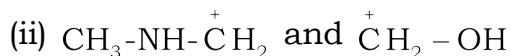
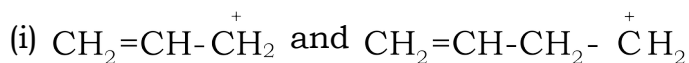
(a) $I > II > III$

(b) $II > III > I$

(c) $III > I > II$

(d) $II > I > III$.

29. In which of the following pairs of carbocations, the first carbocation is more stable than the second?



(a) (i) (ii) and (iii)

(b) (i) (ii) and (iv)

(c) (ii) and (iii)

(d) (iii) and (iv)

-
30. A solution of (+)-2-chloro-2phenylethane in toluene racemises slowly in the presence of a small amount of SbCl_5 , due to the formation of
- | | |
|------------------|-----------------|
| (a) Carbanion | (b) Carbene |
| (c) Free radical | (d) Carbocation |

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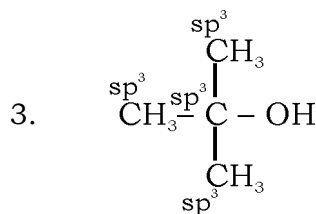
General Organic Chemistry

Answer Key

Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.
1.	A	11.	D	21.	A
2.	B	12.	A	22.	B
3.	C	13.	D	23.	A
4.	A	14.	C	24.	C
5.	B	15.	C	25.	A
6.	D	16.	A	26.	A
7.	D	17.	D	27.	B
8.	B	18.	C	28.	D
9.	A	19.	D	29.	B
10.	B	20.	C	30.	D

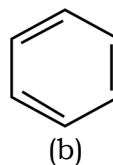
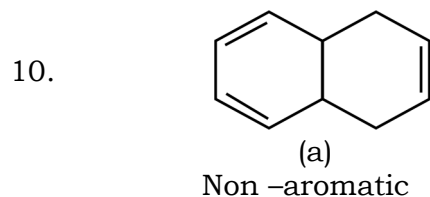
Solution : -

- Carbocations have three pairs (6) electrons in the valence shell.
- Aldehydes and ketones undergo nucleophilic addition reactions.

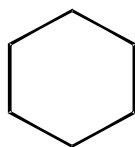


All bonds are σ -bonds and hence C uses only its sp^3 -hybrid orbitals. In all other compounds there is one C=O double bond, therefore, this carbon is sp^2 -hybridized

- Shortest C-C distance (1.20\AA) is in acetylene.
- Homolytic fission of C—C bond gives free radicals in which carbon is sp^2 -hybridized.
- Resonance structures are separated by a double headed arrow (\longleftrightarrow)
- Angle increases progressively $sp^3(109^\circ-28')$, $sp^2(120^\circ)$, $sp(180^\circ)$
- Hyperconjugation.
- Only sp^2 - hybridized C-atoms of phenyl ring and $\text{CH}_2=\text{CH}$ group has essentially planar geometry. All the rest of the groups have sp^3 - hybridized C- atoms and hence have non- planar geometry.

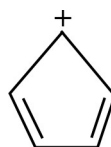


(unconjugated 6π - electrons)




(c)
Alicyclic

Aromatic(conjugated 6π -electrons

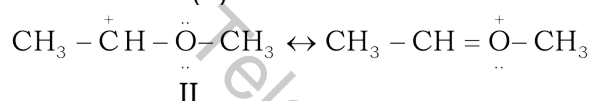


(d)
Antiaromatic (conjugated 4π electrons)

11. II and III have delocalized six π - electrons and hence are aromatic.
12. Greater the electronegativity, higher is the I-effect, *i.e.*, $-\text{NR}_2 < -\text{OR} < -\text{F}$.
13. $\overset{1}{\text{C}}\text{H}_2 = \overset{2}{\text{C}}\text{H} - \overset{3}{\text{C}}\text{H}_2 - \overset{4}{\text{C}}\text{H}_2 - \overset{5}{\text{C}} \equiv \overset{6}{\text{C}}\text{H}$
 $\text{C}_2 - \text{C}_3$ bond has $\text{sp}^2 - \text{sp}^3$ hybridization.
14. $\overset{\text{sp}^3}{\text{CH}_3} - \overset{\text{sp}^2}{\text{CH}} = \overset{\text{sp}}{\text{C}} = \overset{\text{sp}^2}{\text{CH}_2}$
15. Only  is not aromatic ; rest all are aromatic .
16. During catalytic hydrogenation, the hydrogens are transferred from the catalyst to the same side of the double bond, Evidently, smaller the number of R substituents, lesser is the steric hindrance and hence faster is the rate of hydrogenation. Thus, option (a) with two R groups on the same side of the molecule is correct.
17. Due to - R-effect of the - CHO group, oxygen carries δ^- -charge while the terminal carbon carries δ^+ + Charge, *i.e.*,
 $\overset{\delta+}{\text{CH}_2} = \text{CH} - \text{CH} = \overset{\delta-}{\text{O}}$
18. As electronegativity of the atom decreases ($\text{F} > \text{O} > \text{N} > \text{C}$), its tendency to donate a pair of electrons, *i.e.*, nucleophilicity increases. Thus, CH_3^- has the highest nucleophilicity.
19. $p\text{-NO}_2\text{-C}_6\text{H}_4\text{-CH}_2^-$ is the most stable carbanion since electron-withdrawing - NO_2 group stabilizes the carbanion by dispersal of the -ve charge.
20. As the electronegativity of the atom decreases, its nucleophilicity increases. Thus, option (c) is correct.
21. Hyperconjugation effect increases in the order :
 $(\text{CH}_3)_3\text{C}^- < (\text{CH}_3)_2\text{CH}^- < \text{CH}_3\text{CH}_2^-$
22. Substitution reaction
23. $\text{C}_6\text{H}_5\overset{+}{\text{C}}\text{HC}_6\text{H}_5\text{(IV)} > \text{CH}_2 = \text{CH}-\overset{+}{\text{C}}\text{H}_2\text{(III)} > \text{CH}_3-\overset{+}{\text{C}}\text{H}_2\text{(II)} > \text{CH}_2 = \overset{+}{\text{C}}\text{H(I)}$

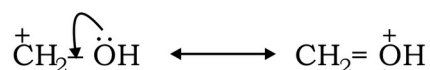
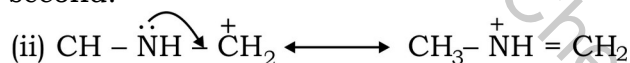
24. Aromatic character increases as the resonance energy increases, Now resonance energies decrease in the order : pyridine ($125.5 \text{ kJ mol}^{-1}$) > thiophene (117 kJ mol^{-1}) > pyrrole (88 kJ mol^{-1}) > furan (71 kJ mol^{-1}). Thus, option (c) is correct.
25. Option (a) is incorrect since the – I-effect of halogens follows the order : $\text{I} < \text{Br} < \text{Cl} < \text{F}$.
26. Both structures (I and IV) are stabilized by resonance.
27. Carbocation (a) is antiaromatic and hence is least stable. Carbocation (b), (c) and (d) are all secondary but (b) and (c) are aromatic. Further since (c) is more strained than (b), therefore, (b) is the most stable carbocation.

28. Carbocation (II) is most stable due to resonance,



Carbocation (III) is least stable due to electron withdrawing effect of the adjacent carbonyl group while carbocation (I) is less stable than (II) because it is only stabilized by the + I-effect of the two CH_3 groups. Thus, the overall order of stability is : $\text{II} > \text{I} > \text{III}$.

29. (i) First carbocation ($\text{CH}_2=\overset{+}{\text{C}}\text{HCH}_2$) is stabilized by resonance but the second ($\text{CH}_2=\text{CHCH}_2\overset{+}{\text{C}}\text{H}_2$) is not. Therefore, first carbocation is more stable than the second.

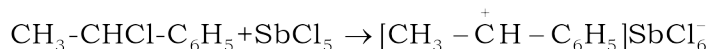


In both the cases, +ve charge is dispersed due to resonance but in the second carbocation +ve charge is located on a more electronegative O- atom. Therefore, first carbocation is more stable than second.

- (iii) Second carbocation ($\text{CH}_3 - \overset{+}{\text{O}} - \overset{+}{\text{C}}\text{H}_2$) is stabilized by resonance but first ($\text{CH}_3 - \text{O} - \text{CH}_2 - \overset{+}{\text{C}}\text{H}_2$) is not. Therefore, carbocation second is more stable than the first.

- (iv) First carbocation ($\text{CH}_3\overset{+}{\text{C}}\text{HCH}_2\text{CH}_2\text{CH}_3$) has five α -hydrogen atoms and hence has five hyperconjugation structures are possible while the second carbocation ($\text{CH}_3\text{CH}_2\overset{+}{\text{C}}\text{HCH}_2\text{CH}_3$) has only four α -hydrogen atoms and hence has four hyperconjugative structures. Therefore, first carbocation is little more stable than the second, Thus the correct answer is option (b).

30. In presence of SbCl_5 , 2-chloro-2-phenylethane forms a carbocation as shown below:

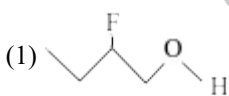

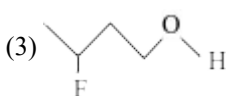
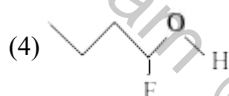
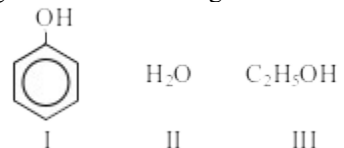


Since the carbocation is planar species, therefore, it can be attacked by SbCl_6^- either from the top or the bottom face with equal ease. As a result, a 50:50 mixture of two enantiomers of 2-chloro-2-phenylethane are formed, i.e. (+) 2-chloro-2-phenylethane undergoes racemization due to the formation of carbocation intermediate.

EXERCISE # 1

(MULTIPLE CHOICE QUESTIONS)

(3) CH_3COOH (4) HCOOH

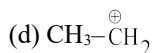
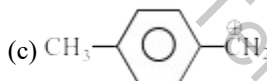
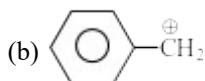
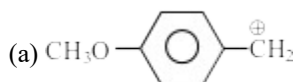
- Q.1** The inductive effect -
 (1) implies the atom's ability to cause bond polarization
 (2) increases with increase of distance
 (3) implies the transfer of lone pair of electrons from more electronegative atom to the lesser electronegative atom in a molecule
 (4) implies the transfer of lone pair of electrons from lesser electronegative atom to the more electronegative atom in a molecule
- Q.2** In which of the following compound is hydroxylic proton the most acidic -
 (1)  (2) 
 (3)  (4) 
- Q.3** Which among the given acid has lowest pKa value -
 (1) Chloroacetic acid (2) Bromoacetic acid
 (3) Nitroacetic acid (4) Cyanoacetic acid
- Q.4** Arrange basic strength of the given compounds in decreasing order -
 (a) $\text{CH}_3\text{-CH}_2\text{-NH}_2$
 (b) $\text{CH}_2\text{=CH-NH}_2$
 (c) $\text{CH}\equiv\text{C-NH}_2$
 (1) $a > b > c$ (2) $a > c > b$
 (3) $c > b > a$ (4) $b > c > a$
- Q.5** Consider following acid
 ClCH_2COOH , CH_3COOH , $\text{CH}_3\text{CH}_2\text{COOH}$
 I II III
 Correct order of their pH value will be -
 (1) $\text{III} < \text{II} < \text{I}$ (2) $\text{I} < \text{II} < \text{III}$
 (3) $\text{I} < \text{III} < \text{II}$ (4) $\text{II} < \text{I} < \text{III}$
- Q.6** Which is most acidic compound -
 (1) $\text{C}_2\text{H}_5\text{COOH}$ (2) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$
- Q.7** Which of the following groups has the highest + I effect -
 (1) $\text{CH}_3\text{-}$ (2) $\text{CH}_3\text{CH}_2\text{-}$
 (3) $(\text{CH}_3)_2\text{CH-}$ (4) $(\text{CH}_3)_3\text{C-}$
- Q.8** Maximum -I effect is exerted by the group
 (1) $\text{C}_6\text{H}_5\text{-}$ (2) $-\text{OCH}_3$
 (3) Cl (4) NO_2
- Q.9** Zero inductive effect is exerted by -
 (1) $\text{C}_6\text{H}_5\text{-}$ (2) H
 (3) $\text{CH}_3\text{-}$ (4) Cl
- Q.10** Pair of groups exerting (-I) effect is
 (1) $-\text{NO}_2$ and $-\text{CH}_3$
 (2) $-\text{NO}_2$ and $-\text{Cl}$
 (3) $-\text{Cl}$ and $-\text{CH}_3$
 (4) $-\text{CH}_3$ and $-\text{C}_2\text{H}_5$
- Q.11** Mesomeric effect is the resonance of -
 (1) π electrons only
 (2) σ electrons only
 (3) π and σ both
 (4) (+) ve and (-) charge.
- Q.12** Mesomeric effect takes part in -
 (1) Saturated system
 (2) Unsaturated system containing conjugated double bond.
 (3) Unsaturated system containing non conjugated double bond.
 (4) A triple bond in a carbon chain
- Q.13** Arrange their Acidic strength

 I II III
 (1) $\text{I} > \text{II} > \text{III}$ (2) $\text{II} > \text{I} > \text{III}$
 (3) $\text{III} < \text{II} > \text{I}$ (4) $\text{II} < \text{III} < \text{I}$
- Q.14** Arrange the following in Increasing of their basicity
 HO^- , CH_3COO^- , Cl^-
 I II III
 (1) $\text{III} > \text{II} > \text{I}$ (2) $\text{III} < \text{II} < \text{I}$
 (3) $\text{II} < \text{III} < \text{I}$ (4) $\text{II} < \text{III} > \text{I}$

- (2) $-\text{NO}_2$ operate both $-I$ and $-M$ in I.
 (3) $-I$ in II is weaker than I
 (4) Due to steric hinderance

Q.25 Which of the following is most stable -

- (1) CH_3^\oplus (2) $\text{CH}_2=\text{CH}^\oplus$
 (3) $\text{CH}\equiv\text{C}^\oplus$ (4) $\text{CH}_3-\text{C}\equiv\text{C}^\oplus$

Q.26 Consider the following carbocations -



The relative stabilities of these carbocations are such that-

- (1) $d < b < c < a$ (2) $b < d < c < a$
 (3) $d < b < a < c$ (4) $b < d < a < c$

Q.27 Least stable carbanion is -

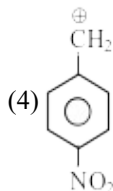
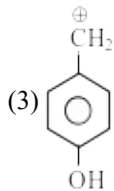
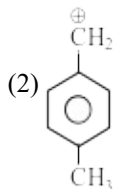
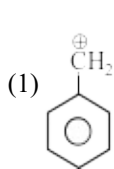
- (1) $\text{HC}\equiv\text{C}^\ominus$ (2)



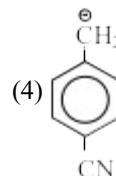
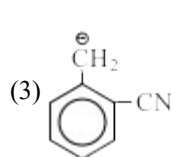
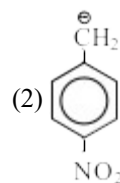
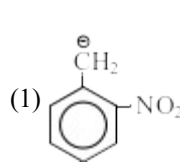
Q.28 Arrange the following nucleophiles in the order of their nucleophilic strength -

- (1) $\text{HO}^- > \text{CH}_3\text{COO}^- > \text{CH}_3\text{O}^- > \text{C}_6\text{H}_5\text{O}^-$
 (2) $\text{CH}_3\text{COO}^- < \text{C}_6\text{H}_5\text{O}^- < \text{CH}_3\text{O}^- < \text{HO}^-$
 (3) $\text{C}_6\text{H}_5\text{O}^- < \text{CH}_3\text{COO}^- < \text{CH}_3\text{O}^- < \text{HO}^-$
 (4) $\text{CH}_3\text{COO}^- < \text{C}_6\text{H}_5\text{O}^- < \text{HO}^- < \text{CH}_3\text{O}^-$

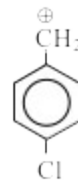
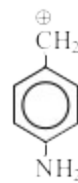
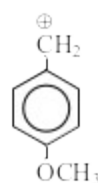
Q.29 Which of the following carbocation is most stable-



Q.30 Which one of the carboanions is most stable-



Q.31 Arrange stability of the given carbocations in decreasing order -



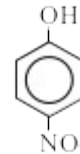
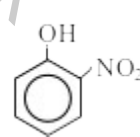
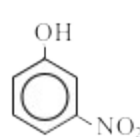
I II III IV

- (1) $I > II > III > IV$
 (2) $III > II > I > IV$
 (3) $IV > I > II > III$
 (4) $II > III > I > IV$

Q.32 In the anion HCOO^- , the two carbon-oxygen bonds are found to be equal length. What is the reason for it -

- (1) the $\text{C}=\text{O}$ bond is weaker than the $\text{C}-\text{O}$ bond
 (2) the anion HCOO^- has two resonating structures
 (3) the electronic orbitals of carbon atom are hybridized
 (4) the anion of obtained by removal of proton from the acid molecule

Q.33



I II III

Arrange following phenol in increasing order of $\text{P}k_a$ value -

- (1) $I < II < III$ (2) $III < I < II$
 (3) $III < II < I$ (4) $I < III < II$

Q.34 What is the decreasing order of strength of the bases, OH^\ominus , NH_2^\ominus , $\text{H}-\text{C}\equiv\text{C}^\ominus$, $\text{CH}_3\text{CH}_2^\ominus$ -

(I) (II) (III) (IV)

- (1) $\text{IV} > \text{II} > \text{III} > \text{I}$ (2) $\text{III} > \text{IV} > \text{II} > \text{I}$
 (3) $\text{I} > \text{II} > \text{III} > \text{IV}$ (4) $\text{II} > \text{III} > \text{I} > \text{IV}$

Q.35 Hyperconjugation occur due to overlapping of-

- (1) π M.O. with 's'
 (2) 'p' orbital with σ
 (3) σ M.O. with π M.O.
 (4) None

Q.36 The stability of given free radicals in decreasing order is -

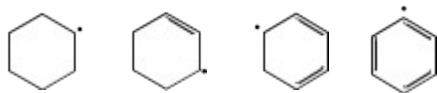
- (a) $\text{CH}_3-\dot{\text{C}}\text{H}_2$ (b) $\text{CH}_3-\dot{\text{C}}\text{H}-\text{CH}_3$
 (c) $\text{CH}_3-\dot{\text{C}}(\text{CH}_3)-\text{CH}_3$ (d) $\dot{\text{C}}\text{H}_3$

- (1) $c > d > a > b$
 (2) $a > b > c > d$
 (3) $c > b > d > a$
 (4) $c > b > a > d$

Q.37 Correct order of stability is -

- (1) $\text{CH}_2=\text{CH}_2 > \text{CH}_3-\text{CH}=\text{CH}_2 > (\text{CH}_3)_2\text{C}=\text{CH}_2$
 (2) $\text{CH}_2=\text{CH}_2 < \text{CH}_3-\text{CH}=\text{CH}_2 < (\text{CH}_3)_2\text{C}=\text{CH}_2$
 (3) $\text{CH}_2=\text{CH}_2 < (\text{CH}_3)_2\text{C}=\text{CH}_2 < \text{CH}_3-\text{CH}=\text{CH}_2$
 (4) $\text{CH}_3-\text{CH}=\text{CH}_2 < \text{CH}_2=\text{CH}_2 < (\text{CH}_3)_2\text{C}=\text{CH}_2$

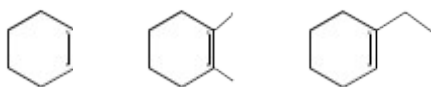
Q.38 Rank the following radicals in order of Decreasing stability -



I II III IV

- (1) $\text{III} > \text{II} > \text{I} > \text{IV}$ (2) $\text{III} > \text{II} < \text{I} < \text{IV}$
 (3) $\text{II} > \text{III} > \text{II} > \text{IV}$ (4) $\text{III} < \text{II} < \text{I} < \text{IV}$

Q.39 Arrange the Stability of following -



- I II III
 (1) $\text{I} < \text{II} < \text{III}$ (2) $\text{II} < \text{I} < \text{III}$
 (3) $\text{I} < \text{III} < \text{II}$ (4) $\text{II} < \text{III} < \text{I}$

Q.40 Which of the following substituents will decrease the acidity of phenol -

- (1) $-\text{NO}_2$ (2) $-\text{CN}$ (3) $-\text{CH}_3$ (4) $-\text{CHO}$

Q.41 Hyperconjugation is possible in which of the following species -

- (1) $\text{CH}_3-\text{CH}_2^\ominus$ (2) $\text{C}_6\text{H}_5-\text{CH}_3$
 (3) $\text{CH}_2=\text{CH}_2$ (4) $\text{CH}_3-\text{C}(\text{CH}_3)_2-\text{CH}=\text{CH}_2$

Q.42 Which of the following carbonium ions will show highest number of hyperconjugation forms -

- (1) $\text{CH}_3-\text{CH}_2^\oplus$ (2) $\text{CH}_3-\text{CH}^\oplus(\text{CH}_3)$
 (3) $\text{CH}_3-\text{C}^\oplus(\text{CH}_3)_2$ (4) $\text{CH}_3-\text{CH}_2-\text{C}^\oplus(\text{CH}_3)_2$

Q.43 Which of the following substituted carboxylic acids has the highest K_a value -

- (1) $\text{CH}_3-\text{CH}_2-\text{CH}(\text{Cl})-\text{COOH}$
 (2) $\text{CH}_3-\text{CH}(\text{Cl})-\text{CH}_2-\text{COOH}$
 (3) $\text{CH}_2(\text{Cl})-\text{CH}_2-\text{CH}_2-\text{COOH}$
 (4) $\text{CH}_3-\text{CH}(\text{Br})-\text{CH}_2-\text{COOH}$

Q.44 Which is more acidic than phenol -

- (1) (2)
 (3) (4) All the above

Q.45 Choose the most stable Carbocation

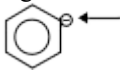
- (1) $\text{CH}_3\text{-CH=CH-}\overset{\oplus}{\text{C}}\text{H}_2$
- (2) $\text{CH}_2\text{=CH-}\overset{\oplus}{\text{C}}\text{H-CH}_3$
- (3) $\text{CH}_2\text{=}\overset{\oplus}{\text{C}}\text{-CH}_2\text{-CH}_3$
- (4) $\text{CH}_2\text{=CH-CH}_2\text{-}\overset{\oplus}{\text{C}}\text{H}_2$

Q.46 Which of the following is wrong about resonance -

- (1) Resonating structures having same energy have same contribution
- (2) All resonating structures have same number of unpaired electron.
- (3) All resonating structures have same number of bond pair electrons.
- (4) All resonating structures have same amount of net charge.

Q.47 Which of the following effect does not stabilises carbanion -

- (1) - I effect
- (2) - M effect
- (3) Hyper conjugation
- (4) All the above

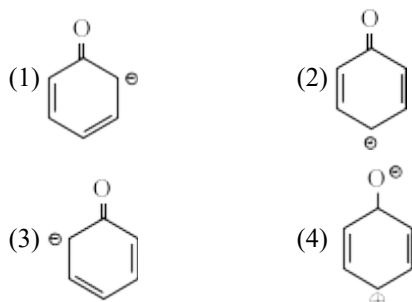
Q.48 Which of the following statement is correct about arrow headed 'C' of 

- (1) Negative charge is delocalised due to sp^2 hybridisation
- (2) sp^2 hybridised but (-)ve charge is localised.
- (3) sp^3 hybridised and (-)ve charge is not delocalised.
- (4) sp^3 hybridised and (-)ve charge is delocalised.

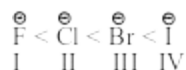
Q.49 Charge on carbon free radical is -

- (1) Zero
- (2) Positive
- (3) Negative
- (4) All of these

Q.50 Which of the following is not the resonance contributor for phenoxide ion -



Q.51 Consider the following ions -



Increasing order of nucleophilicity in polar solvent will be -

- (1) $\text{I} < \text{II} < \text{III} < \text{IV}$
- (2) $\text{II} < \text{I} < \text{IV} < \text{III}$
- (3) $\text{IV} < \text{III} < \text{II} < \text{I}$
- (4) $\text{III} < \text{IV} < \text{II} < \text{I}$

Q.52 Most stable carbonium ion in the following will be -



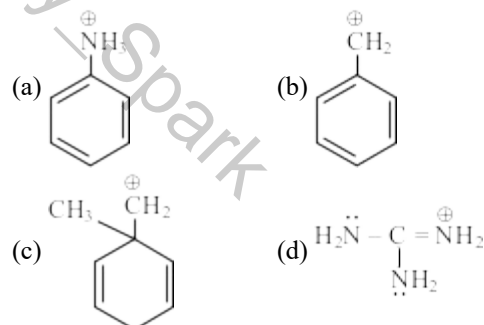
Q.53 Which of the following is not correct statement -

- (1) NH_2^\ominus is a stronger base
- (2) CCl_3^\ominus is more basic than CF_3^\ominus
- (3) NH_2OH is less basic than NH_3
- (4) $\text{CH}\equiv\text{C}^\ominus$ is less basic than $\text{CH}_2=\text{CH}^\ominus$

Q.54 Which one of the following is strongest acid -

- (1) 2-chloropentanoic acid
- (2) 3-chloropentanoic acid
- (3) 5-chloropentanoic acid
- (4) 4-chloropentanoic acid

Q.55 Which has localized \oplus ve charge -

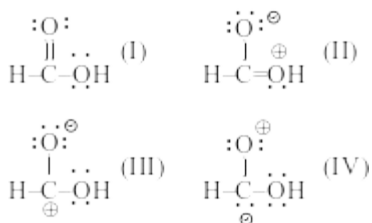


- (1) a, d
- (2) a, c
- (3) c, d
- (4) b, d

Q.56 Most powerful leaving group in following-

- (1) NH_2^\ominus
- (2) HO^\ominus
- (3) CH_3^\ominus
- (4) F^\ominus

Q.57



Increasing order of stability is-

- (1) I < III < II < IV
 (2) IV < III < II < I
 (3) III < IV < II < I
 (4) II < IV < III < I

Q.58

Consider the following three halides -

- (A) $\text{CH}_3-\text{CH}_2-\text{Cl}$
 (B) $\text{CH}_2=\text{CH}-\text{Cl}$
 (C) $\text{C}_6\text{H}_5-\text{Cl}$

Arrange C-Cl bond length of these compound in decreasing order -

- (1) A > B > C (2) A > C > B
 (2) C > B > A (4) B > C > A

Q.59

Arrange the following in increasing basic strength-

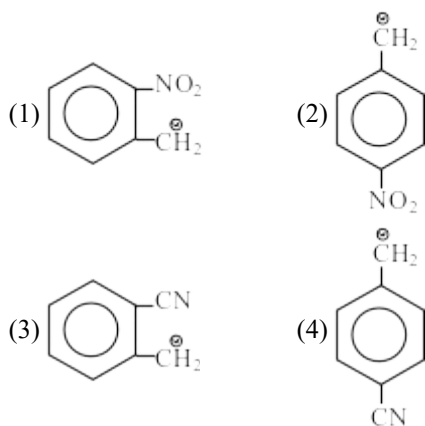
- (a) CH_3NH_2 (b) $\text{NO}_2-\text{C}(\text{NH}_2)_2$
 (c) $\text{Cl}-\text{CH}_2-\text{NH}_2$ (d) $\text{I}-\text{CH}_2-\text{NH}_2$
 (e) NH_3

Correct answer is -

- (1) (a) < (b) < (c) < (e) < (d)
 (2) (a) < (b) < (c) < (d) < (e)
 (3) (b) < (c) < (d) < (e) < (a)
 (4) (c) < (b) < (e) < (d) < (a)

Q.60

Which one of the carbanions is most stable?



Q.61

What is the correct increasing order of bond lengths of the bonds indicated as I, II, III and IV in following compounds -



- (1) I < II < III < IV (2) II < III < IV < I
 (3) IV < II < III < I (4) IV < I < II < III

Q.62

Most stable carbocation is -

- (1) $\text{CH}_3-\text{CH}_2^+$ (2) $^+\text{CH}_2\text{CHCl}_2$
 (3) $^+\text{CH}_2\text{CH}_2\text{Cl}$ (4) $^+\text{CH}_2-\text{CH}_2\text{NO}_2$

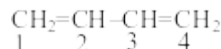
Q.63

In which compound delocalisation is not possible -

- (1) 2-Butene (2) 1, 3-Butadiene
 (3) 1, 3, 5-Hexatriene (4) Benzene

Q.64

Consider the following compound :



carbon-carbon bond length between C_2 and C_3 will be -

- (1) 1.54 Å
 (2) 1.3 Å
 (3) Less than 1.54 and greater than 1.33 Å
 (4) 1.21 Å

Q.65

In pyridine ; Number of conjugated electrons are -

- (1) 6 (2) 8
 (3) zero (4) 5

Q.66

Which is the decreasing order of acidity in, HCOOH (I), CH_3COOH (II), $\text{CH}_3\text{CH}_2\text{COOH}$ (III) and $\text{C}_6\text{H}_5\text{COOH}$ (IV) -

- (1) I > II > III > IV
 (2) IV > III > II > I
 (3) IV > I > II > III
 (4) I > IV > II > III

Q.67

Consider the following carbocations -

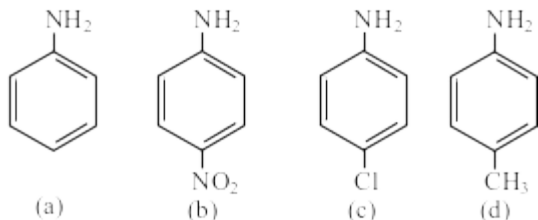
- (a) $\text{CH}_3-\text{CH}_2^+$ (b) $\text{CH}_2=\text{CH}^+$



Stability of these carbocations in decreasing order is -

- (1) $d > c > a > b$ (2) $d > c > b > a$
 (3) $c > d > b > a$ (4) $c > d > a > b$

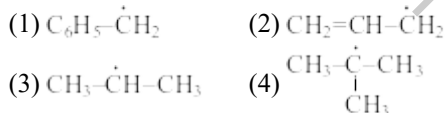
Q.68 Consider the following compounds -



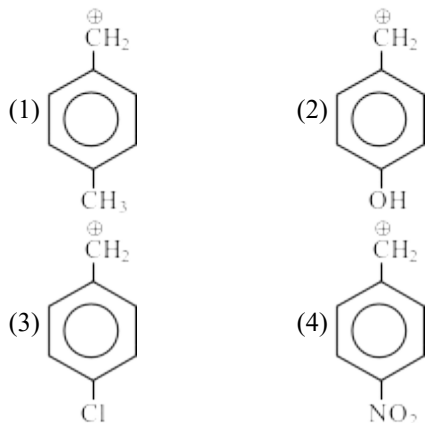
Arrange these compounds in decreasing order of their basicity :

- (1) $a > b > c > d$
 (2) $b > c > a > d$
 (3) $d > a > c > b$
 (4) $d > a > b > c$

Q.69 Which free radical is the most stable -



Q.70 Which carbocation is the most stable -



Q.71 Electromeric effect -

- (1) comes into play at the demand of attacking reagent
 (2) involves displacement of electrons in a sigma bond
 (3) comes into play in the molecule when at least one atom has unshared pair of electrons
 (4) involves the distortion of the electron cloud

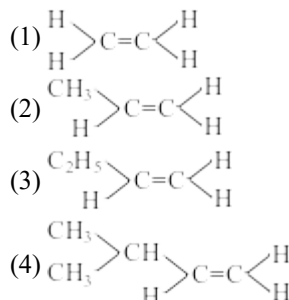
Q.72 Which statement is correct for electromeric effect -

- (1) It is a temporary effect
 (2) It is the property of π bond
 (3) It takes place in presence of reagent, i.e., electrophile or nucleophile
 (4) All are correct

Q.73 The number of electrons present in the valence shell of carbon of CH_3CH_2^+ ion bearing +ve charge :

- (1) 8 (2) 7
 (3) 6 (4) 4

Q.74 Which of the following is most stable alkene ?



Q.75 Homolytic fission of a hydrocarbon will liberate -

- (1) Carbonium ions (2) carbanions
 (3) free radicals (4) carbenes

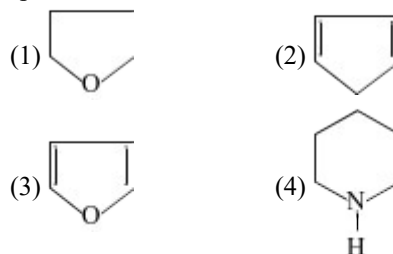
Q.76 Heterolytic fission of carbon-chlorine bond produces -

- (1) two free radicals
 (2) two carbonium ions
 (3) two carbonions
 (4) one cation and one anion

Q.77 In $\text{CH}_3\text{CH}_2\text{OH}$, the bond that undergoes heterolytic cleavage most readily is -

- (1) C—C (2) C—O
 (3) C—H (4) O—H

Q.78 Which of the following is heterocyclic aromatic species ?



Q.79 The hybridisation of saturated carbanion is -

- (1) sp^3 (2) sp^2
 (3) sp (4) All of these

Q.80 Carbanion of $CH_3\overset{\ominus}{C}H_2$ has geometry -

- (1) Planar (2) Pyramidal
 (3) Squar bipyramidal (4) All of the above

Q.81 Hybridisation of $R-\overset{\bullet}{C}H_2$ is -

- (1) sp^3 (2) sp^2
 (3) sp (4) All of these

Q.82 The enolic form of acetone contains -

- (1) 9 sigma bonds, 1 pi bond and 2 lone pairs
 (2) 8 sigma bonds, 2 pi bonds and 2 lone pairs
 (3) 10 sigma bonds, 1 pi bond and 1 lone pair
 (4) 9 sigma bonds, 2 pi bonds and 1 lone pair

Q.83 Carbene is an -

- (1) Electrophile (2) Nucleophile
 (3) Very strong base (4) All of these

Q.84 Unshared pair of electron is contained by -

- (1) Carbocation (2) Singlet carbene
 (3) Triplet carbene (4) All of these

Q.85 Which of the following statements are correct for nucleophile -

- (1) All negatively charged species are nucleophile
 (2) Nucleophiles are Lewis bases
 (3) Alkenes, alkynes, benzene and pyrrole are nucleophiles
 (4) All are correct

Q.86 Which among the following species is an ambident nucleophile ?

- (1) $CH_3-\overset{\ominus}{C}H_2$ (2) $CH_2=CH_2$
 (3) $\overset{\ominus}{C}N$ (4) $\ddot{N}H_3$

Q.87 In each of the following pairs of species which species is an electrophile -

- (1) $\ddot{N}H_3$ & $\ddot{N}F_3$ (2) $\ddot{P}H_3$ & $\ddot{P}Cl_3$
 (3) CH_4 & CCl_4 (4) $H_2\ddot{O}$ & $\ddot{C}Cl_2$

Q.88 Which of the following reaction intermediates are electrophilic in character -

- (a) Carbocation (b) Carbanion
 (c) Free radicals (d) Carbenes
 (1) Only b (2) a and c
 (3) a, c and d (4) a, b, c and d

Q.89 Which among the following compounds behave both as an electrophile as well as a nucleophile-

- (a) $CH_2=CH_2$ (b) $CH_2=CH-\overset{\ominus}{C}H_2$
 (c) $\begin{array}{c} O \\ || \\ CH_3-C-CH_3 \end{array}$ (d) $\begin{array}{c} O \\ || \\ CH_3-C-Cl \end{array}$
 (1) Only a (2) a and b
 (3) c and d (4) b, c and d

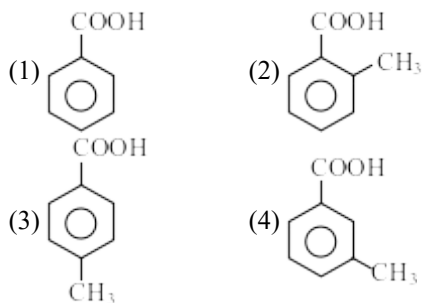
Q.90 Which of the following can behave as a nucleophile -

- (1) HOH (2) R-OH
 (3) R-NH₂ (4) All of these

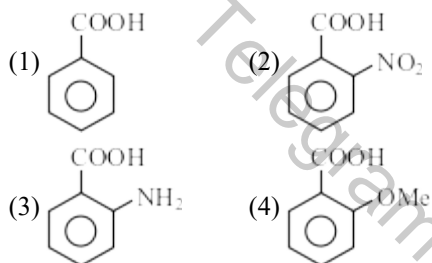
EXERCISE # 2

(BRAIN TWISTERS)

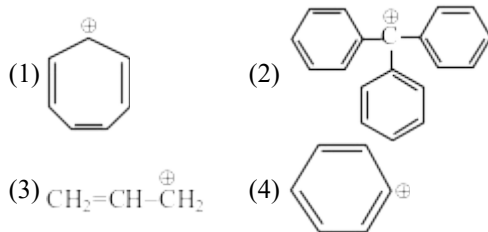
Q.1 Which is most acidic compound -



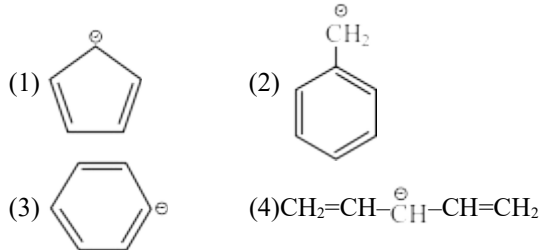
Q.2 Which is maximum acidic compound -



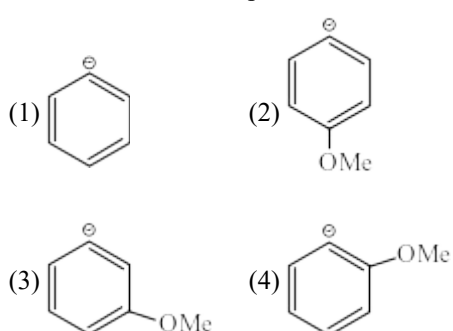
Q.3 Which is most stable carbocation -



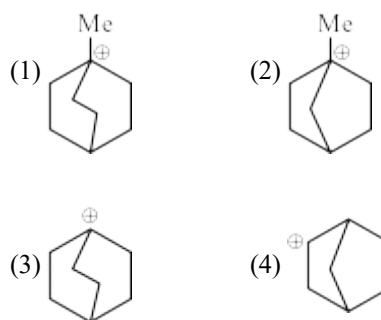
Q.4 Which is most stable carbanion -



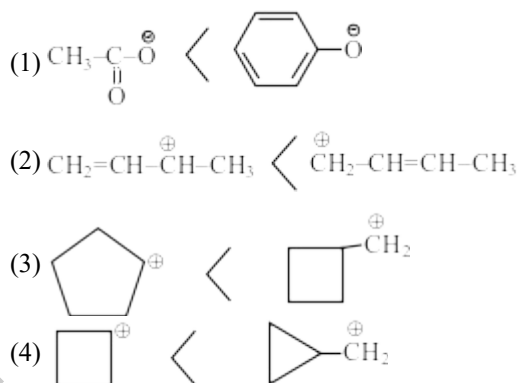
Q.5 Which is most stable species -



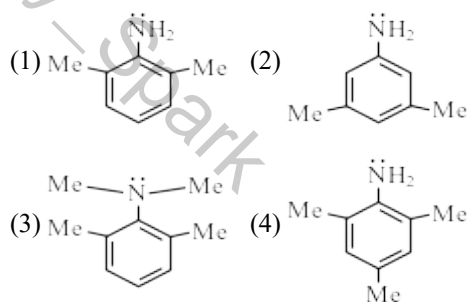
Q.6 Which is most stable carbocation -



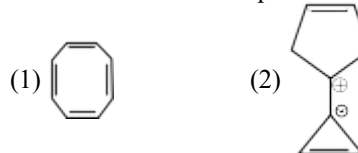
Q.7 Which is correct stability order -

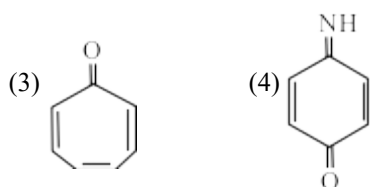


Q.8 Which is most basic compound -

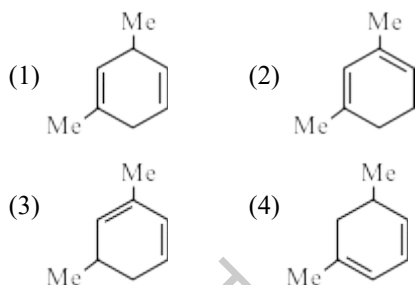


Q.9 Which is aromatic compound -

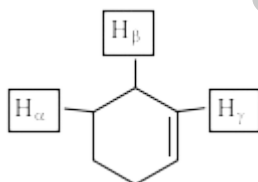




Q.10 Which of the following diene is most stable -

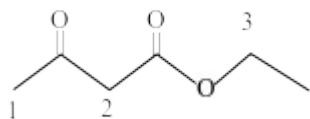


Q.11 Rank the hydrogen atoms according to their acidic strength



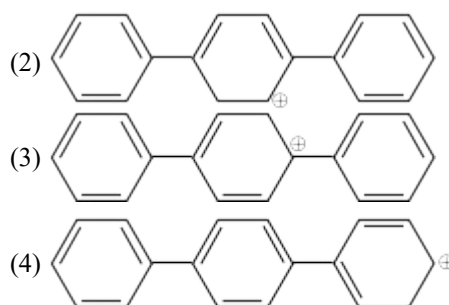
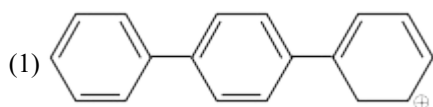
- (1) $\alpha > \beta > \gamma$ (2) $\beta > \gamma > \alpha$
 (3) $\gamma > \beta > \alpha$ (4) $\alpha > \gamma > \beta$

Q.12 Consider the hydrogen atoms attached to three different carbon atoms (labeled 1, 2 & 3). Rank the attached hydrogen atoms in order from most acidic to least acidic -

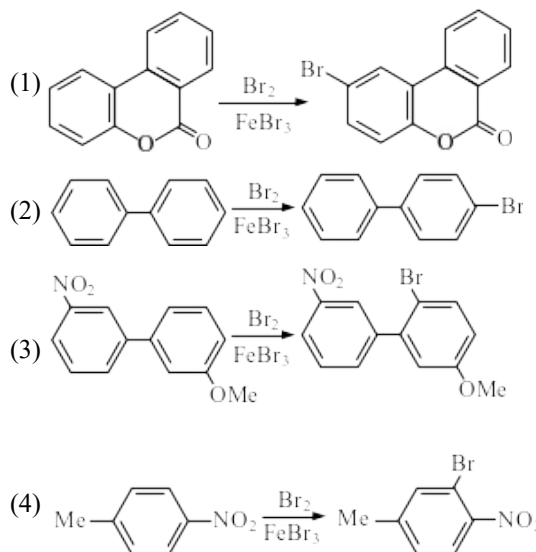


- (1) $1 > 2 > 3$ (2) $2 > 1 > 3$
 (3) $2 > 3 > 1$ (4) $3 > 2 > 1$

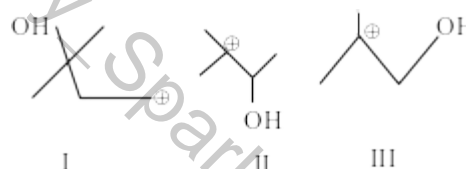
Q.13 the most stable carbocation among the following is -



Q.14 Which of the following electrophilic substitution reaction represent incorrect product -

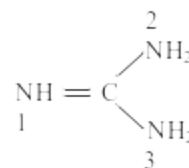


Q.15 Arrange the Carbocations in decreasing order of stability -

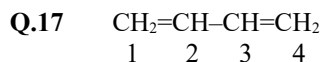


- (1) $I > II > III$ (2) $I > III > II$
 (3) $II > III > I$ (4) $III > II > I$

Q.16 Which nitrogen is protonated readily in the guanidine ?



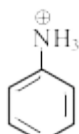
- (1) 1 (2) 2
 (3) 3 (4) None of these



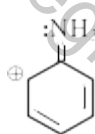
The bond between $\text{C}_2 - \text{C}_3$ is shorter than single bond because -

- (1) +I effect
- (2) -I effect
- (3) M effect
- (4) Hyper conjugative effect

Q.18 Examine the following two structures for the anilinium ion and choose the correct statement from the ones given below.



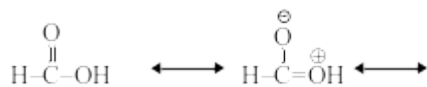
I



II

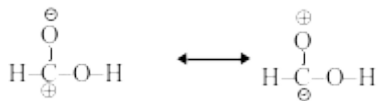
- (1) II is not an acceptable canonical structure because carbonium ions are less stable than ammonium ion.
- (2) II is not an acceptable canonical structure because it is non-aromatic.
- (3) II is not an acceptable canonical structure because the nitrogen has 10 valence electrons
- (4) II is an acceptable canonical structure

Q.19 Formic acid is considered as a resonance hybrid of the four structure -



I

II



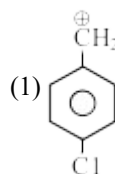
III

IV

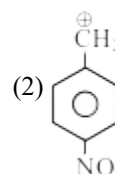
Which of the following order is correct for the stability of the four contributing structures?

- (1) $\text{I} > \text{II} > \text{III} > \text{IV}$
- (2) $\text{I} > \text{II} > \text{IV} > \text{III}$
- (3) $\text{I} < \text{III} < \text{II} < \text{IV}$
- (4) $\text{I} > \text{IV} > \text{III} > \text{II}$

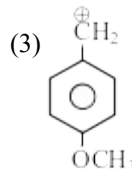
Q.20 Most stable carbocation is:



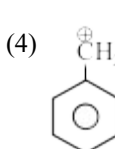
(1)



(2)

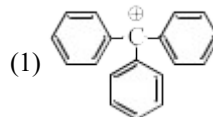


(3)

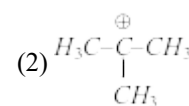


(4)

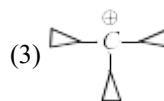
Q.21 Which is most stable carbocation -



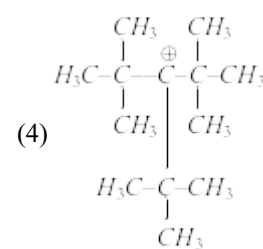
(1)



(2)



(3)

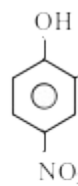


(4)

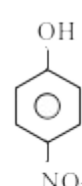
Q.22 , pK_a value of the compound decreases if X is:

- (1) $-\text{NO}_2$
- (2) $-\text{NH}_2$
- (3) $-\text{OH}$
- (4) $-\text{OCH}_3$

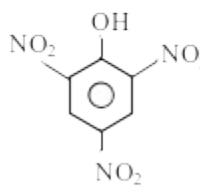
Q.23 The correct order of increasing dissociation constant of the following compound is-



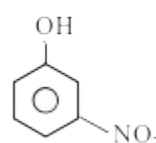
I



II



III



IV

- (1) $\text{II} < \text{IV} < \text{I} < \text{III}$
- (2) $\text{IV} < \text{III} < \text{I} < \text{II}$
- (3) $\text{IV} < \text{II} < \text{I} < \text{III}$
- (4) $\text{IV} < \text{I} < \text{II} < \text{III}$

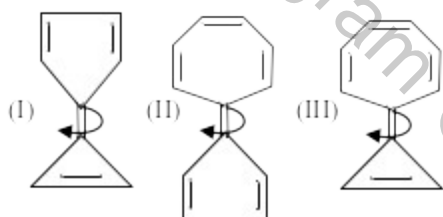
Q.24 Which of the following shows the correct order of decreasing acidity-

- (1) $\text{PhCO}_2\text{H} > \text{PhSO}_3\text{H} > \text{PhCH}_2\text{OH} > \text{PhOH}$
- (2) $\text{PhSO}_3\text{H} > \text{PhOH} > \text{PhCO}_2\text{H} > \text{PhCH}_2\text{OH}$
- (3) $\text{PhCO}_2\text{H} > \text{PhOH} > \text{PhCH}_2\text{OH} > \text{PhSO}_3\text{H}$
- (4) $\text{PhSO}_3\text{H} > \text{PhCO}_2\text{H} > \text{PhOH} > \text{PhCH}_2\text{OH}$

Q.25 Arrange the following in correct order of acidic strength-

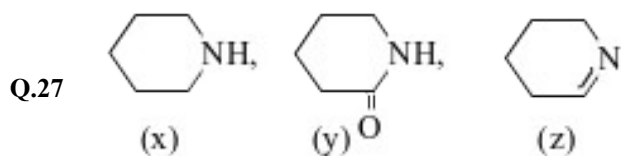
- (I) $\text{CH}_3\text{-NO}_2$ (II) $\text{NO}_2\text{-CH}_2\text{-NO}_2$
 (III) $\text{CH}_3\text{-CH}_2\text{-NO}_2$ (IV) $\begin{array}{c} \text{NO}_2\text{-CH-NO}_2 \\ | \\ \text{NO}_2 \end{array}$

- (1) $\text{IV} > \text{II} > \text{I} > \text{III}$ (2) $\text{IV} > \text{II} > \text{III} > \text{I}$
- (3) $\text{III} > \text{I} > \text{II} > \text{IV}$ (4) $\text{III} > \text{I} > \text{IV} > \text{II}$



Compare carbon-carbon bond rotation across I, II, III.

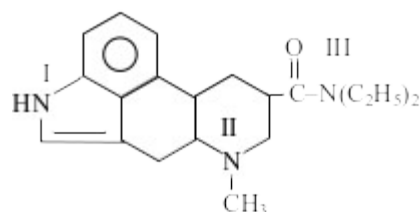
- (1) $\text{I} > \text{II} > \text{III}$ (2) $\text{I} > \text{III} > \text{II}$
- (3) $\text{II} > \text{I} > \text{III}$ (4) $\text{II} > \text{III} > \text{I}$



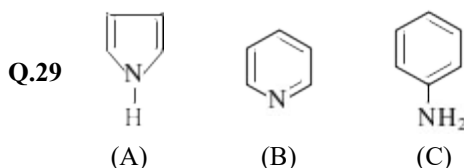
The correct order of decreasing basic strengths of x, y and z is:

- (1) $x > y > z$ (2) $x > z > y$
- (3) $y > x > z$ (4) $y > z > x$

Q.28 Which nitrogen in LSD (Lysergic acid and diethylamide) is more basic -



- (1) I (2) II
- (3) III (4) All are equally basic



Choose the incorrect statement -

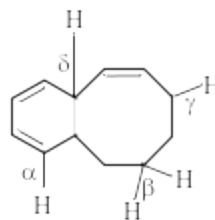
- (1) A is more basic than B
- (2) B is more basic than A
- (3) B is more basic than C
- (4) All are aromatic bases

Q.30 Which of the following is false statement -

- (1) Protonation decreases electrophilic nature of carbonyl group
- (2) CF_3SO_3^- is better leaving group than CH_3SO_3^-
- (3) Benzyl carbonium ion is stabilised by resonance
- (4) $\text{CCl}_3\text{-CH(OH)}_2$ is stable gem-diol

Q.31 Aromatic character is possible only when -

- (1) six electrons are delocalized
- (2) the molecule is cyclic and planar having delocalized $(4n + 2)\pi$ electrons where $n = 1, 2, 3, \dots$
- (3) alternate sigma (σ) & pi (π) bond are present
- (4) None is true



Column A	Column B
Bond	Dissociation Energy (kJ/mol)
(a) α	(i) 20

- (b) β (ii) 100
 (c) γ (iii) 30
 (d) δ (iv) 50

- (1) a \rightarrow (ii), b \rightarrow (iv), c \rightarrow (iii), d \rightarrow (i)
 (2) a \rightarrow (i), b \rightarrow (ii), c \rightarrow (iii), d \rightarrow (iv)
 (3) a \rightarrow (iv), b \rightarrow (iii), c \rightarrow (ii), d \rightarrow (i)
 (4) a \rightarrow (ii), b \rightarrow (iii), c \rightarrow (iv), d \rightarrow (i)

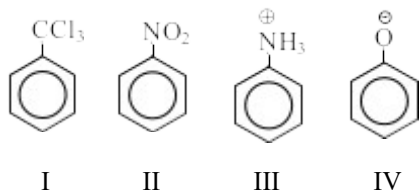
Q.33 The strongest base is—

- (1) $\text{CH}_3\text{-N(CH}_3\text{)-CH}_3$ (2) $\text{H}_2\text{N-C(=NH)-NH}_2$
 (3) $\text{C}_6\text{H}_5\text{-N(CH}_3\text{)-C}_6\text{H}_5$ (4) $\text{CH}_3\text{-NH-CH}_3$

Q.34 Arrange (all dibasic) Increasing order of their K_a value -

- oxalic acid, succinic acid,
 I II
 malonic acid, adipic acid
 III IV
 (1) III < II < I < IV (2) II < III > I > IV
 (3) I > III > II > IV (4) II > I > III < IV

Q.35 Electrophile NO_2^+ attacks the following



In which cases NO_2^+ will be meta-position :

- (1) II and IV (2) I, II and III
 (3) II and III only (4) I only

Q.36 Increasing order of the stability is -

- $\text{CH}_3\text{CH=CH}_2$ (I) $\text{CH}_3\text{CH}_2\text{CH=CH}_2$ (II)
 $\text{CH}_3\text{C(CH}_3\text{)=CHCH=CH}_2$ (III) $(\text{CH}_3)_3\text{CCH=CH}_2$ (IV)
 (1) I > II > III > IV (2) I > III > II > IV
 (3) I > IV > III > II (4) IV > III > II > I

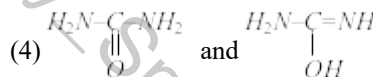
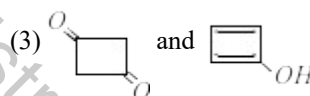
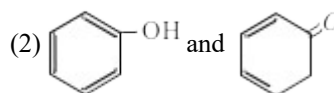
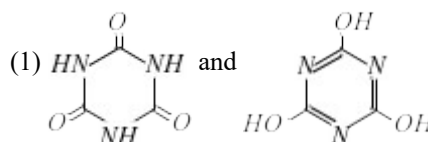
Q.37 Decreasing order of Basic strength is -

- (1) $\text{RO}^- > \text{HO}^- > \text{CN}^- > \text{RCOO}^- > \text{NO}_3^-$

- (2) $\text{NO}_3^- > \text{CN}^- > \text{RCOO}^- > \text{RO}^- > \text{HO}^-$
 (3) $\text{HO}^- > \text{CN}^- > \text{RCOO}^- > \text{NO}_3^- > \text{RO}^-$
 (4) $\text{NO}_3^- > \text{CN}^- > \text{RCOO}^- > \text{RO}^- \approx \text{HO}^-$

Q.38 In electrophilic substitution occurs at -
 (1) o/p of 1st ring (2) meta at 1st ring
 (3) o/p at 2nd ring (4) meta of 2nd ring.

Q.39 Which of the following is not a pair of tautomers -



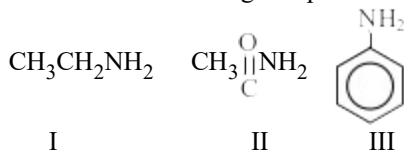
Q.40 Different hydrogens in

- a b c d e f

$\text{CH}_3\text{CH=CH-CH}_2\text{-CH}_2\text{-CH(CH}_3\text{)}_2$ are represented by alphabets. Arrange them in decreasing order of reactivity towards radical substitution -

- (1) c > a > e > d > f > b
 (2) f > b > a > c > d > e
 (3) b > c > a > f > d > e
 (4) a > b > c > d > e > f

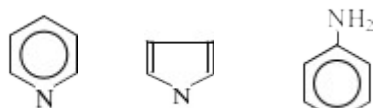
Q.41 Consider the following compounds



Correct order of their basic strength is -

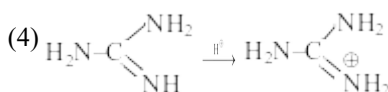
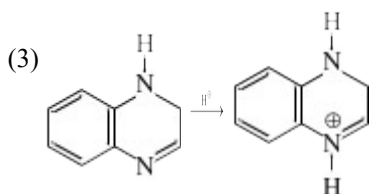
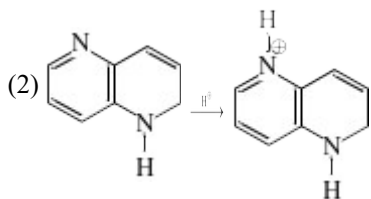
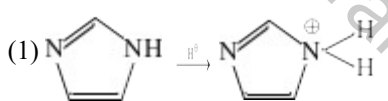
- (1) I < II < III (2) II > I > III
(3) III > II < I (4) II < III < I

Q.42 Arrange the following in decreasing of their basic nature -

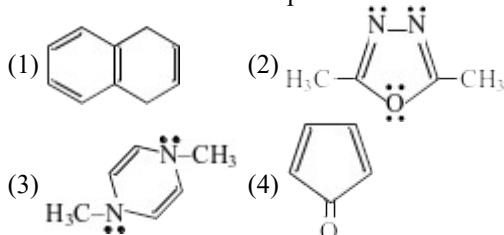


- (1) I > II > III (2) II < III < I
(3) III < II > I (4) II > I > III

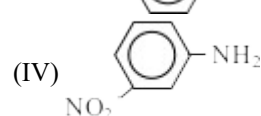
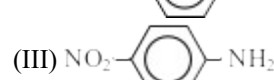
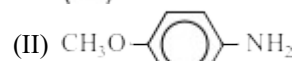
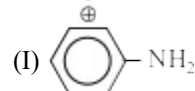
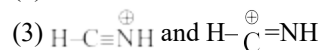
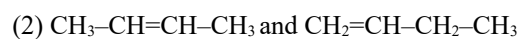
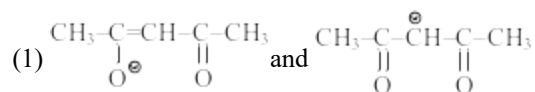
Q.43 Which of the following acid-base reaction is not feasible -



Q.44 Which is an aromatic compound -



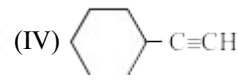
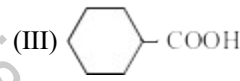
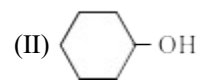
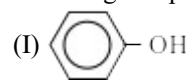
Q.45 Which of the following pairs of structures is not a pair of resonating structures -



The correct order of decreasing basicity of the above compound is -

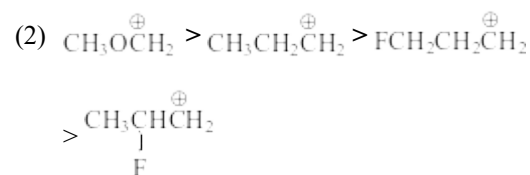
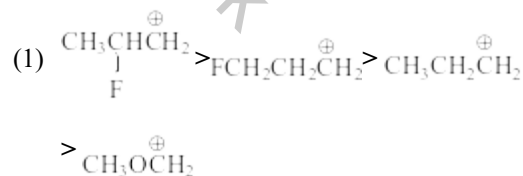
- (1) I > II > III > IV (2) II > I > IV > III
(3) III > IV > II > I (4) II > I > III > IV

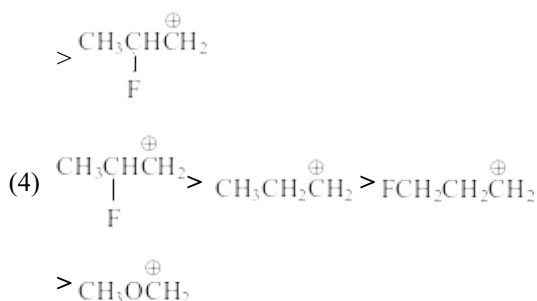
Q.47 Give the correct order of increasing acidity of the following compounds -



- (1) II < I < IV < III (2) IV < II < I < III
(3) I < II < IV < III (4) IV < I < II < III

Q.48 The correct order of increasing stability of the following carbocations is -





Q.49 Which of the following shows the correct order of stability -

- (1) $\text{CH}_3\text{OCH}^+\text{CH}_3 < \text{CH}_3\text{OCH}_2^+ < \text{CH}_3\text{CH}_2\text{CH}_2^+$
- (2) $\text{CH}_3\text{CH}_2\text{CH}_2^+ < \text{CH}_3\text{OCH}^+\text{CH}_3 < \text{CH}_3\text{OCH}_2^+$
- (3) $\text{CH}_3\text{CH}^+\text{CH}_3 < \text{CH}_3\text{OCH}_2^+ < \text{CH}_3\text{OCH}^+\text{CH}_3$
- (4) $\text{CH}_3\text{OCH}_2^+ < \text{CH}_3\text{OCH}^+\text{CH}_3 < \text{CH}_3\text{CH}_2\text{CH}_2^+$

Q.50 Which of the following shows the correct order of decreasing stability -

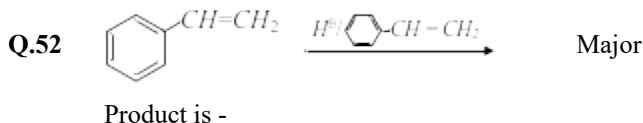
- (1) $\text{CH}_3\text{-C}_6\text{H}_4\text{-CH}_2^+ > \text{CH}_3\text{O-C}_6\text{H}_4\text{-CH}_2^+ > \text{C}_6\text{H}_5\text{-CH}_2^+ > \text{CH}_3\text{-CH}_2^+$
- (2) $\text{CH}_3\text{O-C}_6\text{H}_4\text{-CH}_2^+ > \text{CH}_3\text{-C}_6\text{H}_4\text{-CH}_2^+ > \text{C}_6\text{H}_5\text{-CH}_2^+ > \text{CH}_3\text{-CH}_2^+$
- (3) $\text{C}_6\text{H}_5\text{-CH}_2^+ > \text{CH}_3\text{O-C}_6\text{H}_4\text{-CH}_2^+ > \text{CH}_3\text{-C}_6\text{H}_4\text{-CH}_2^+ > \text{CH}_3\text{-CH}_2^+$
- (4) $\text{CH}_3\text{O-C}_6\text{H}_4\text{-CH}_2^+ > \text{C}_6\text{H}_5\text{-CH}_2^+ > \text{CH}_3\text{-C}_6\text{H}_4\text{-CH}_2^+ > \text{CH}_3\text{-CH}_2^+$

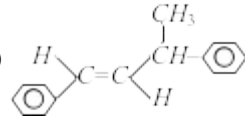
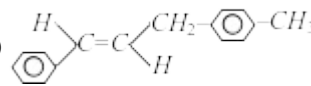
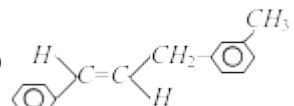
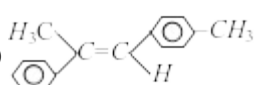
Q.51 Among the following alkenes

1-butene	trans-2-butene
(I)	(III)
cis-2-butene	Isobutene
(II)	(IV)



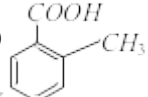
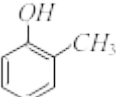
the order of decreasing stability is -

- (1) $\text{II} > \text{I} > \text{III} > \text{IV}$
- (2) $\text{III} > \text{IV} > \text{I} > \text{II}$
- (3) $\text{IV} > \text{I} > \text{II} > \text{III}$
- (4) $\text{IV} > \text{III} > \text{II} > \text{I}$



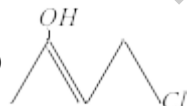



- (1) 
- (2) 
- (3) 
- (4) 

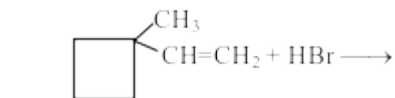
Q.53 Which is most acidic compound -

- (1) 
- (2) 
- (3) 
- (4) 

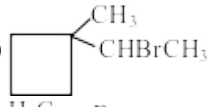
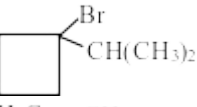
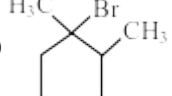

Q.54  product will be -

- (1) 
- (2) 
- (3) 
- (4) 

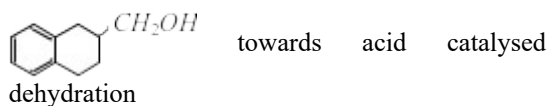
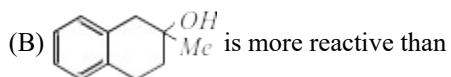
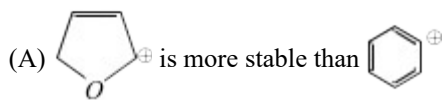
Q.55 In the reaction



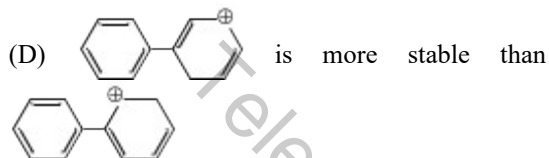
the major product formed is -

- (1) 
- (2) 
- (3) 
- (4) 

Q.56 Which is correct among the following -



(C) 1-Butene is more stable than 2-butene



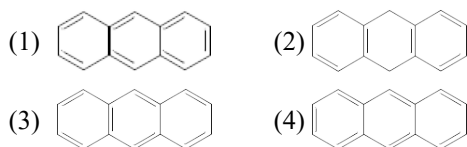
(1) A, C

(2) B, C, D

(3) A, B, C

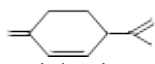
(4) A, B, D

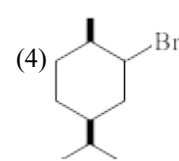
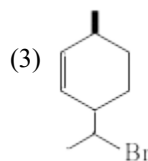
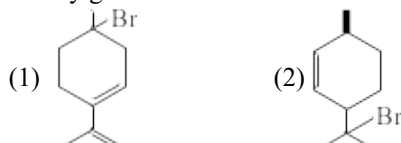
Q.57 Which of the following is most stable resonating structure of anthracene ?



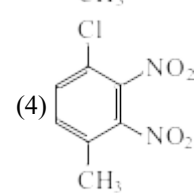
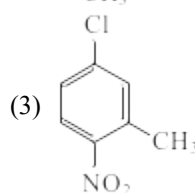
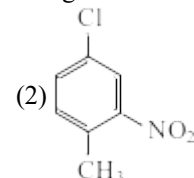
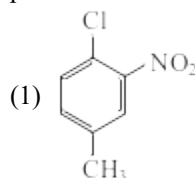
Q.58 Which of the following statements are correct -

- (1) I^- is a better leaving group than Cl^-
- (2) In aprotic solvent the nucleophilicity order is $F > Cl^- > Br^- > I^-$.
- (3) CH_3COO^- is less stable than $CH_3SO_3^-$
- (4) All of the above

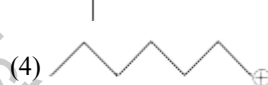
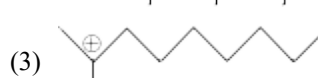
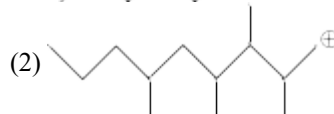
Q.59  reacts with one mole of HBr to mainly gives -



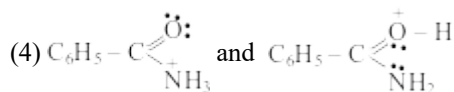
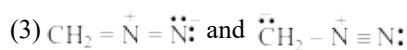
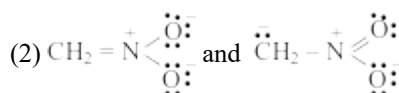
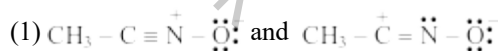
Q.60 p-Chlorotoluene on nitration gives



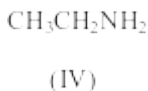
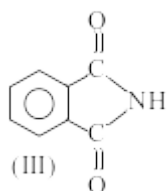
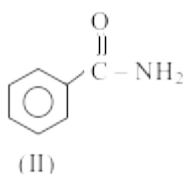
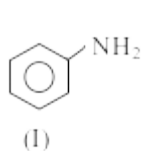
Q.61 Select the most stable carbonocation among the following -



Q.62 Which of the following pairs does not represent resonance structures ?

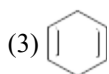
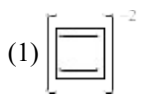


Q.63 Give the correct order of increasing acidity of the hydrogen bonded to nitrogen in the following compounds -



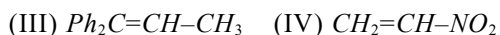
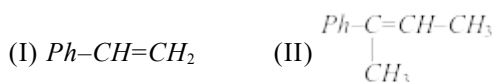
- (1) $\text{III} < \text{II} < \text{IV} < \text{I}$ (2) $\text{IV} < \text{I} < \text{II} < \text{III}$
 (3) $\text{II} < \text{I} < \text{III} < \text{IV}$ (4) $\text{I} < \text{IV} < \text{II} < \text{III}$

Q.64 Which is aromatic species -



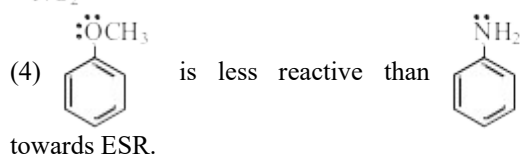
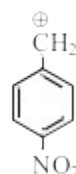
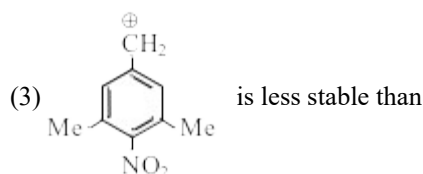
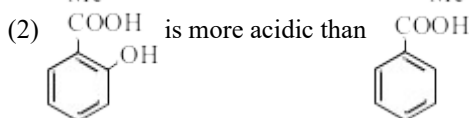
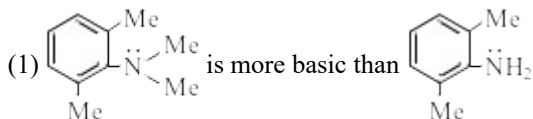
(4) All the above

Q.65 Arrange the following compounds in decreasing order of reactivity for *EAR* -

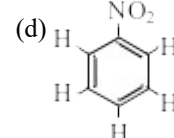
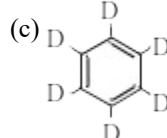
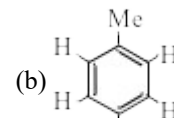
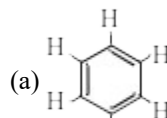


- (1) $\text{IV} > \text{I} > \text{II} > \text{III}$ (2) $\text{III} > \text{II} > \text{I} > \text{IV}$
 (3) $\text{II} > \text{III} > \text{I} > \text{IV}$ (4) $\text{II} > \text{III} > \text{IV} > \text{I}$

Q.66 Which is incorrect statement -

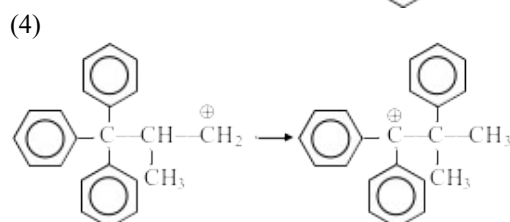
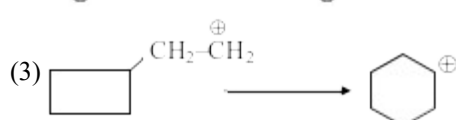
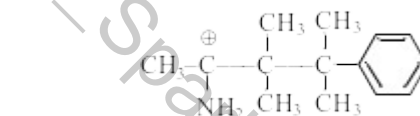
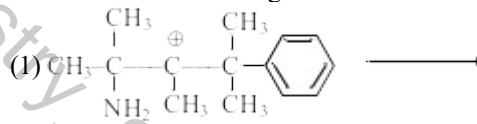


Q.67 Arrange the following in decreasing order of rate of nitration -

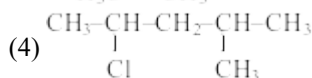
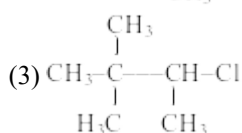
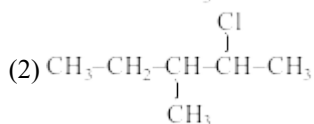
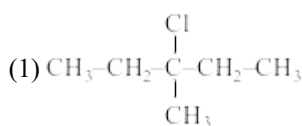


- (1) $b > a = c > d$ (2) $d > a = c > b$
 (3) $b > a > c > d$ (4) $a > c > d > b$

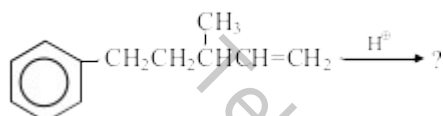
Q.68 Which is invalid rearrangement of carbocation -



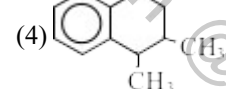
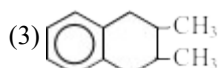
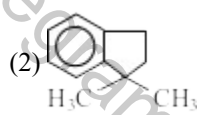
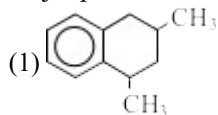
Q.69 The major product formed when 3-methyl-1-pentene reacts with HCl is -



Q.70

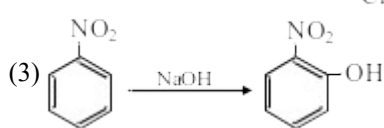
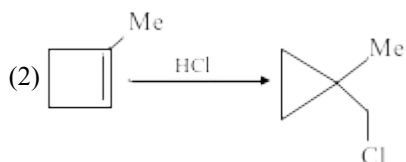
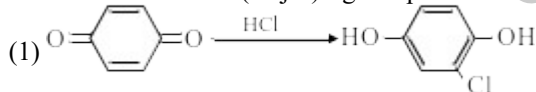


Major product of this reaction is -



Q.71

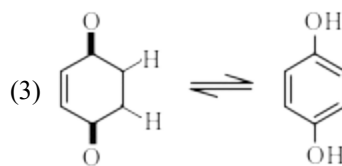
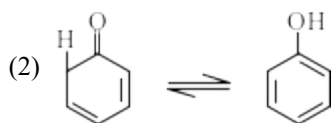
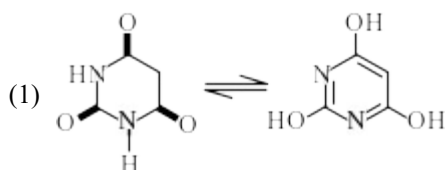
Which shows correct (major) organic product :



(4) All the above

Q.72

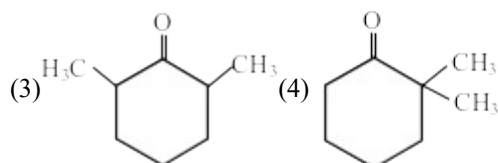
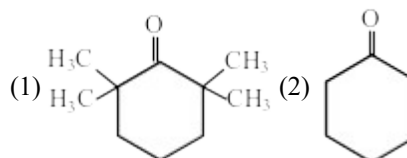
In which of the following keto-enol systems the enol state is more stable than the keto state :



(4) All the above

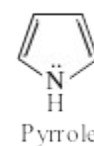
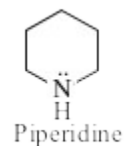
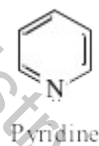
Q.73

Which compound has most active hydrogen atom ?



Q.74

The hybridization states of the nitrogen atoms in pyridine, piperidine and pyrrole are respectively

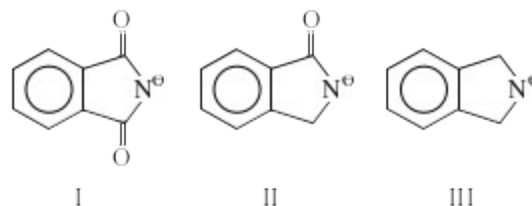


are respectively

(1) sp^2 , sp^3 and sp^2 (2) sp^2 , sp^3 and sp^3

(3) sp^3 , sp^3 and sp^3 (4) sp^2 , sp^2 and sp^2

Q.75

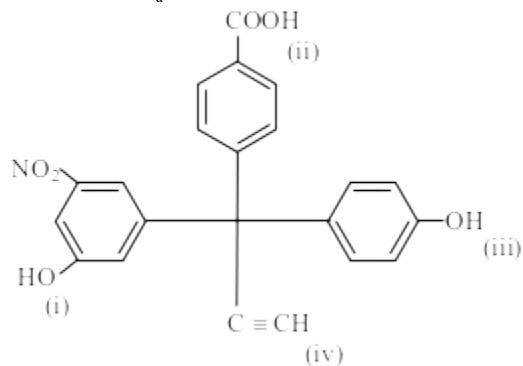


The basic strength of the ions I, II and III decrease in the order

(1) $\text{I} > \text{II} > \text{III}$ (2) $\text{III} > \text{II} > \text{I}$

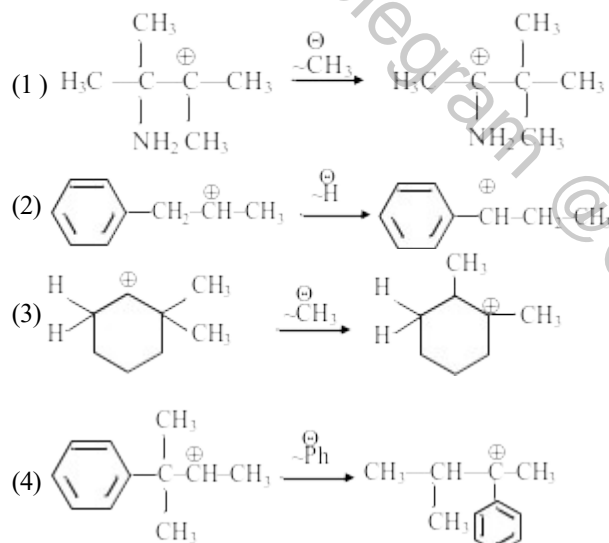
(3) $\text{II} > \text{I} > \text{III}$ (4) $\text{I} > \text{III} > \text{II}$

Q.76 Which of the following represent the decreasing order of K_a values ?

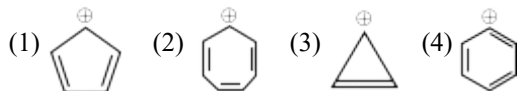


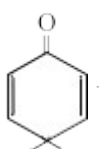
- (A) (ii) > (i) > (iii) > (iv)
 (B) (ii) > (iii) > (i) > (iv)
 (C) (i) > (ii) > (iii) > (iv)
 (D) (ii) > (iv) > (i) > (iii)

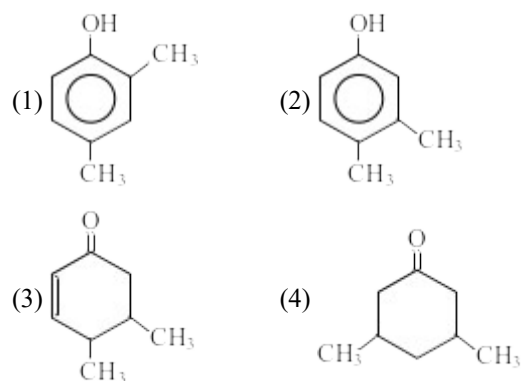
Q.77 Which is invalid rearrangement of carbocation -



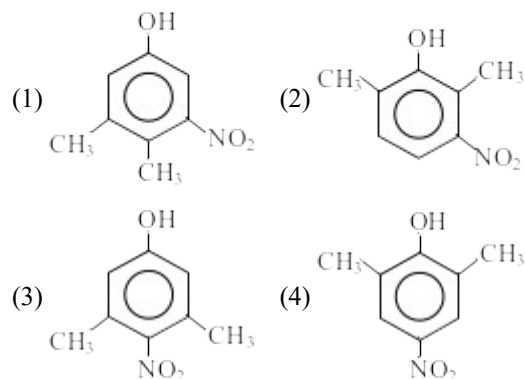
Q.78 The most stable carbocation is -



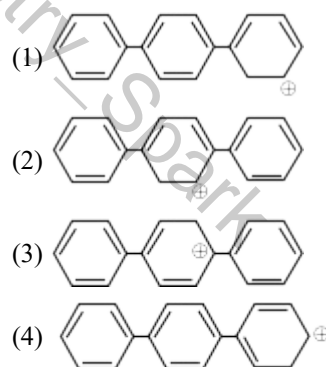
Q.79  $\xrightarrow{H^+}$ Major product is -



Q.80 Which one of the following is maximum acidic -



Q.81 The most stable carbocation is -



EXERCISE # 3A

(AIPMT & AIIMS QUESTIONS)

- Q.1** Polarization in acrolein as – [AIPMT-2000]
 $(1) \overset{+\delta}{\text{CH}_2}=\overset{-\delta}{\text{CH}}-\overset{-\delta}{\text{CHO}} \quad (2) \overset{-\delta}{\text{CH}_2}=\overset{+\delta}{\text{CH}}-\overset{+\delta}{\text{CHO}}$
 $(3) \overset{-\delta}{\text{CH}_2}=\overset{+\delta}{\text{CH}}-\overset{+\delta}{\text{CHO}} \quad (4) \overset{+\delta}{\text{CH}_2}=\overset{-\delta}{\text{CH}}-\overset{-\delta}{\text{CHO}}$
- Q.2** Correct order of stability is – [AIPMT-2000]
 $(1) 1\text{-butene} > \text{trans-2-butene} > \text{cis-2-butene}$
 $(2) \text{trans-2-butene} > 1\text{-butene} > \text{cis-2-butene}$
 $(3) \text{trans-2-butene} > \text{cis-2-butene} > 1\text{-butene}$
 $(4) \text{cis-2-butene} > \text{trans-2-butene} > 1\text{-butene}$
- Q.3** $\text{CH}_2=\text{C}(\text{CH}_3)-\text{CH}_3$ and $\text{CH}_2=\text{C}(\text{CH}_3)-\text{CH}_3$ are – [AIPMT-2002]
 $(1) \text{Resonating structures} \quad (2) \text{Tautomers}$
 $(3) \text{Geometrical isomers} \quad (4) \text{Optical isomers}$
- Q.4** The correct order of reactivity towards the electrophilic substitution of the compounds aniline (I), benzene (II) and nitrobenzene (III) is – [AIPMT-2003]
 $(1) \text{III} > \text{II} > \text{I} \quad (2) \text{II} > \text{III} > \text{I}$
 $(3) \text{I} < \text{II} > \text{III} \quad (4) \text{I} > \text{II} > \text{III}$
- Q.5** Which of the following order of acidic strength is correct – [AIPMT-2003]
 $(1) \text{RCOOH} > \text{ROH} > \text{HOH} > \text{HC}\equiv\text{CH}$
 $(2) \text{RCOOH} > \text{HOH} > \text{ROH} > \text{HC}\equiv\text{CH}$
 $(3) \text{RCOOH} > \text{HOH} > \text{HC}\equiv\text{CH} > \text{ROH}$
 $(4) \text{RCOOH} > \text{HC}\equiv\text{CH} > \text{HOH} > \text{ROH}$
- Q.6** Among the following the weakest base is – [AIIMS-2003]
 $(1) \text{C}_6\text{H}_5\text{CH}_2\text{NH}_2 \quad (2) \text{C}_6\text{H}_5\text{CH}_2\text{NHCH}_3$
 $(3) \text{O}_2\text{NCH}_2\text{NH}_2 \quad (4) \text{CH}_3\text{NHCHO}$
- Q.7** The o-/p- directing group among the following is [AIIMS-2003]
 $(1) \text{COOH} \quad (2) \text{CN} \quad (3) \text{COCH}_3 \quad (4) \text{NHCOCH}_3$
- Q.8** Among the following strongest acid is – [AIIMS-2003]
 $(1) \text{CH}_3\text{COOH} \quad (2) \text{C}_6\text{H}_5\text{COOH}$
 $(3) m\text{-CH}_3\text{OC}_6\text{H}_4\text{COOH} \quad (4) p\text{-CH}_3\text{OC}_6\text{H}_4\text{COOH}$
- Q.9** Which of the following is least reactive in a nucleophilic substitution reaction – [AIPMT-2004]
 $(1) \text{CH}_2=\text{CHCl} \quad (2) \text{CH}_3\text{CH}_2\text{Cl}$
 $(3) \text{CH}_2=\text{CHCH}_2\text{Cl} \quad (4) (\text{CH}_3)_2\text{C}-\text{Cl}$
- Q.10** The strongest base among the following is – [AIIMS-2004]
 $(1) \text{Pyridine} \quad (2) \text{Pyrrolidine} \quad (3) \text{Piperidine} \quad (4) \text{Aniline}$
- Q.11** Among the following the dissociation constant is highest for – [AIIMS-2004]
 $(1) \text{C}_6\text{H}_5\text{OH} \quad (2) \text{C}_6\text{H}_5\text{CH}_2\text{OH}$
 $(3) \text{CH}_3\text{C}\equiv\text{CH} \quad (4) \text{CH}_3\text{NH}_3^+\text{Cl}^-$
- Q.12** Among the following the aromatic compound is – [AIIMS-2004]
 $(1) \text{Cyclopropadienyl cation} \quad (2) \text{Cyclopentadienyl cation}$
 $(3) \text{Cyclohexadienyl cation} \quad (4) \text{Cycloheptatrienyl cation}$
- Q.13** Which amongst the following is the most stable carbocation – [AIPMT-2005]
 $(1) \text{CH}_3\text{CH}_2^+ \quad (2) \text{CH}_3^+$
 $(3) (\text{CH}_3)_3\text{C}^+ \quad (4) (\text{CH}_3)_2\text{CH}^+$
- Q.14** Which one of the following compounds is most acidic – [AIPMT-2005]
 $(1) \text{p-Nitrophenol} \quad (2) \text{m-Nitrophenol}$
 $(3) \text{p-Cresol} \quad (4) \text{m-Cresol}$
- Q.15** Pyridine is less basic than triethylamine because [AIIMS-2005]
 $(1) \text{Pyridine has aromatic character}$
 $(2) \text{Nitrogen in pyridine is } sp^2 \text{ hybridized}$
 $(3) \text{Pyridine is a cyclic system}$
 $(4) \text{In pyridine, lone pair of nitrogen is delocalized}$
- Q.16** Which of the following is more basic than aniline – [AIPMT-2006]
 $(1) \text{Diphenyl amine} \quad (2) \text{Triphenyl amine}$
 $(3) p\text{-nitro aniline} \quad (4) \text{Benzyl amine}$
- Q.17** Nucleophilic addition reaction will be most favoured in – [AIPMT-2006]
 $(1) \text{CH}_3\text{CH}_2\text{CH}_2\text{C}(=\text{O})\text{CH}_3 \quad (2) \text{CH}_3\text{C}(=\text{O})\text{CH}_3$
 $(3) \text{CH}_3\text{CH}_2\text{CH}_2\text{C}(=\text{O})\text{H} \quad (4) \text{CH}_3\text{C}(=\text{O})\text{H}$

Q.18 Which of the following presents the correct order of the acidic strength in the given compounds –

[AIPMT-2007]

- (1) $\text{FCH}_2\text{COOH} > \text{CH}_3\text{COOH} > \text{BrCH}_2\text{COOH} > \text{ClCH}_2\text{COOH}$
 (2) $\text{BrCH}_2\text{COOH} > \text{ClCH}_2\text{COOH} > \text{FCH}_2\text{COOH} > \text{CH}_3\text{COOH}$
 (3) $\text{FCH}_2\text{COOH} > \text{ClCH}_2\text{COOH} > \text{BrCH}_2\text{COOH} > \text{CH}_3\text{COOH}$
 (4) $\text{CH}_3\text{COOH} > \text{BrCH}_2\text{COOH} > \text{ClCH}_2\text{COOH} > \text{FCH}_2\text{COOH}$

Q.19 For the following : [AIPMT-2007]

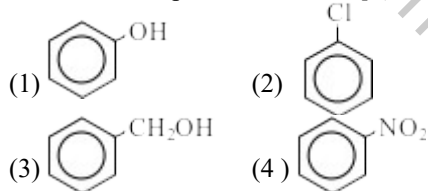
- (a) I^- (b) Cl^- (c) Br^-
 the increasing order of nucleophilicity would be –
 (1) $\text{Cl}^- < \text{Br}^- < \text{I}^-$ (2) $\text{I}^- < \text{Cl}^- < \text{Br}^-$
 (3) $\text{Br}^- < \text{Cl}^- < \text{I}^-$ (4) $\text{I}^- < \text{Br}^- < \text{Cl}^-$

Q.20 The order of decreasing reactivity towards electrophilic reagent for the following :

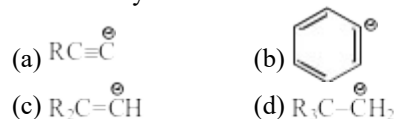
[AIPMT-2007]

- (A) Benzene (B) Toluene
 (C) Chloro benzene (D) Phenol
 (1) $\text{B} > \text{D} > \text{A} > \text{C}$ (2) $\text{D} > \text{C} > \text{B} > \text{A}$
 (3) $\text{D} > \text{B} > \text{A} > \text{C}$ (4) $\text{A} > \text{B} > \text{C} > \text{D}$

Q.21 Which one of the following is most reactive towards electrophilic attack – [AIPMT-2008]



Q.22 The stability of carbanions in the following –



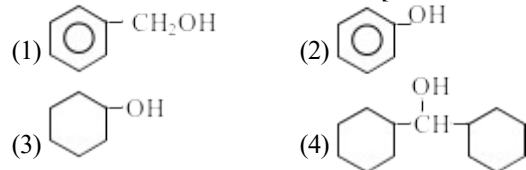
- is in the order of – [AIPMT-2008]
 (1) $(\text{d}) > (\text{b}) > (\text{c}) > (\text{a})$ (2) $(\text{a}) > (\text{c}) > (\text{b}) > (\text{d})$
 (3) $(\text{a}) > (\text{b}) > (\text{c}) > (\text{d})$ (4) $(\text{b}) > (\text{c}) > (\text{d}) > (\text{a})$

Q.23 Given are cyclohexanol (I), acetic acid (II) 2,4,6-trinitrophenol (III) and phenol (IV). In these the order of decreasing acidic character will be

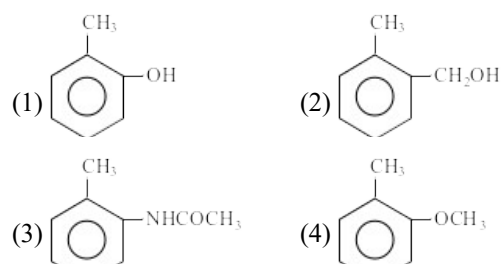
[AIPMT-2011]

- (1) $\text{III} > \text{II} > \text{IV} > \text{I}$ (2) $\text{II} > \text{III} > \text{I} > \text{IV}$
 (3) $\text{II} > \text{III} > \text{IV} > \text{I}$ (4) $\text{III} > \text{IV} > \text{II} > \text{I}$

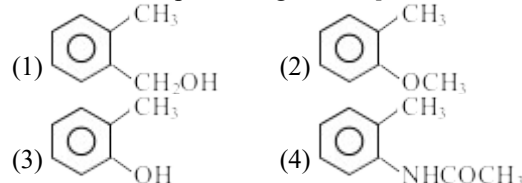
Q.24 Which one of the following compounds has the most acidic nature [AIPMT-2012]



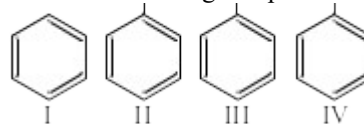
Q.25 Which one is most reactive towards electrophilic reagent? [AIPMT-2013]



Q.26 Which one of the following is most reactive towards electrophilic reagent ? [AIPMT-2015]



Q.27 Consider the following compounds :



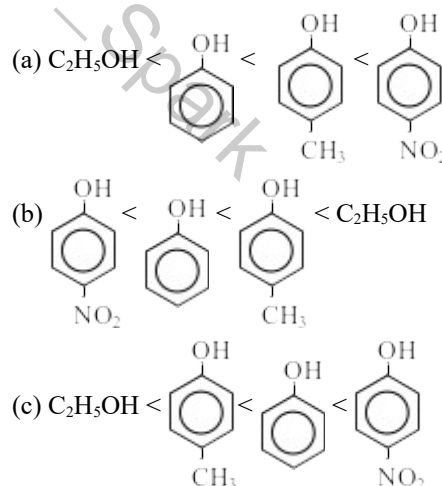
Correct order of their reactivity in electrophilic substitution reactions would be ?

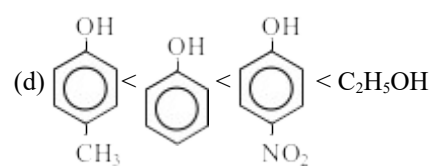
- (a) $\text{I} > \text{II} > \text{III} > \text{IV}$ (b) $\text{IV} > \text{III} > \text{II} > \text{I}$
 (c) $\text{III} > \text{II} > \text{I} > \text{IV}$ (d) $\text{III} > \text{IV} > \text{I} > \text{III}$

Q.28 In the free-radical halogenation of alkanes, chain propagating step is –

- (a) $\text{Cl}_2 \xrightarrow{h\nu} 2\text{Cl}^\bullet$
 (b) $\text{CH}_4 + \text{Cl}^\bullet \rightarrow \text{CH}_3\text{Cl} + \text{H}^\bullet$
 (c) $\text{CH}_4 + \text{Cl}^\bullet \rightarrow \text{CH}_3^\bullet + \text{HCl}$
 (d) $\text{CH}_3^\bullet + \text{Cl}^\bullet \rightarrow \text{CH}_3\text{Cl}$

Q.29 Correct increasing order of acidity of the following phenols is –





Telegram @Chemistry_Spark

EXERCISE # 3B

(OTHER EXAM QUESTIONS)

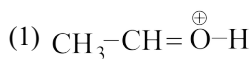
[RPMT-2005]

Q.1 The number of π electrons in benzene are –

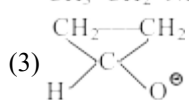
[RPMT-2000]

- (1) $8\pi e^-$ (2) $3\pi e^-$
(3) $6\pi e^-$ (4) $2\pi e^-$

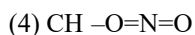
Q.2 Which of the following structure is wrong –



[RPMT-2001]



3



Q.3 In benzene C–C bond length between all carbons

are equal because of –

[RPMT-2001]

2

- (1) Tautomerism (2) sp hybridization
(3) Isomerism (4) Resonance

Q.4 Aryl halide less reactive than alkyl halide towards nucleophilic substitution because –

- (1) Less stable carbonium ion [RPMT-2002]
(2) Due to large C–Cl bond energy
(3) Inductive effect
(4) Resonance stabilisation and sp^2 hybridisation of carbons attached to halide

Q.5 Correct order of acidic strength is –

[RPMT-2003]

- (1) $\text{HCOOH} > \text{CH}_3\text{COOH} > \text{C}_2\text{H}_5\text{COOH}$
(2) $\text{C}_2\text{H}_5\text{COOH} > \text{CH}_3\text{COOH} > \text{HCOOH}$
(3) $\text{HCOOH} > \text{C}_2\text{H}_5\text{COOH} > \text{CH}_3\text{COOH}$
(4) $\text{CH}_3\text{COOH} > \text{HCOOH} > \text{C}_2\text{H}_5\text{COOH}$

Q.6 The least reactive chlorine is present in –

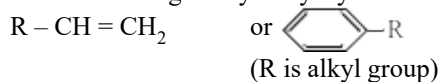
- (1) Methyl chloride (2) Allyl chloride
(3) Ethyl chloride (4) Vinyl chloride

Q.7 Which of the following has maximum pK_a –

[RPMT-2006]

- (1) CH_2FCOOH (2) CH_2ClCOOH
(3) CH_3COOH (4) HCOOH

Q.8 In the following benzyl/alkyl system



increasing order of inductive effect is –

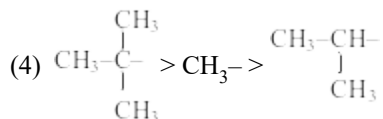
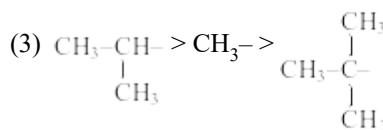
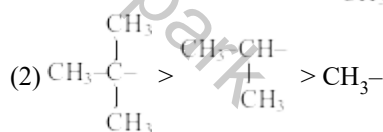
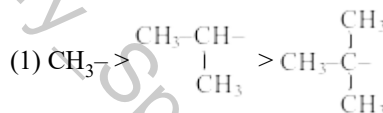
[AIIEEE-2002]

- (1) $(\text{CH}_3)_3\text{C}- > (\text{CH}_3)_2\text{CH}- > \text{CH}_3\text{CH}_2-$
(2) $(\text{CH}_3\text{CH}_2)- > (\text{CH}_3)_2\text{CH}- > (\text{CH}_3)_3\text{C}-$
(3) $(\text{CH}_3)_2\text{CH}- > \text{CH}_3\text{CH}_2- > (\text{CH}_3)_3\text{C}-$
(4) $(\text{CH}_3)_3\text{C}- > \text{CH}_3\text{CH}_2- > (\text{CH}_3)_2\text{CH}-$

Q.9

When $-\text{CH}_3$, $\begin{array}{c} \text{CH}_3-\text{CH}- \\ | \\ \text{CH}_3 \end{array}$ & $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{C}- \\ | \\ \text{CH}_3 \end{array}$ groups are

introduced on benzene ring then correct order of their electronic effect is – [AIIEEE-2002]

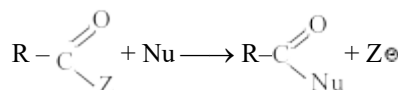


Q.10 The correct order of increasing basic strength of the bases NH_3 , CH_3NH_2 and $(\text{CH}_3)_2\text{NH}$ is –

[AIIEEE-2003]

- (1) $\text{NH}_3 < \text{CH}_3\text{NH}_2 < (\text{CH}_3)_2\text{NH}$
 (2) $\text{CH}_3\text{NH}_2 < (\text{CH}_3)_2\text{NH} < \text{NH}_3$
 (3) $\text{CH}_3\text{NH}_2 < \text{NH}_3 < (\text{CH}_3)_2\text{NH}$
 (4) $(\text{CH}_3)_2\text{NH} < \text{NH}_3 < \text{CH}_3\text{NH}_2$

Q.11 Rate of the reaction [AIEEE-2005]



is fastest when Z is -

- (1) Cl (2) NH_2
 (3) OC_2H_5 (4) OCOCH_3

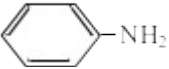
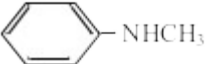
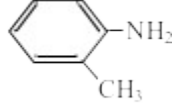
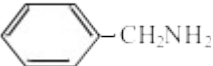
Q.12 Consider the acidic nature of the carboxylic acids - [AIEEE-2004]

- (a) PhCOOH
 (b) $\text{o}-\text{NO}_2\text{C}_6\text{H}_4\text{COOH}$
 (c) $\text{p}-\text{NO}_2\text{C}_6\text{H}_4\text{COOH}$
 (d) $\text{m}-\text{NO}_2\text{C}_6\text{H}_4\text{COOH}$

Which of the following order is correct ?

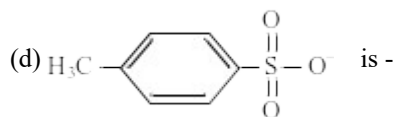
- (1) $a > b > c > d$ (2) $b > d > c > a$
 (3) $b > d > a > c$ (4) $b > c > d > a$

Q.13 Which of the following is the strongest base -

- (1)  [AIEEE-2004]
 (2) 
 (3) 
 (4) 

Q.14 The decreasing order of nucleophilicity among the nucleophiles [AIEEE-2005]

- (a) $\text{CH}_3\text{C}(=\text{O})\text{O}^-$ (b) CH_3O^- (c) CN^-



- (1) $(d) > (c) > (b) > (a)$
 (2) $(a) > (b) > (c) > (d)$
 (3) $(c) > (b) > (a) > (d)$
 (4) $(b) > (c) > (a) > (d)$

Q.15 Amongst the following the most basic compound is- [AIEEE-2005]

- (1) aniline (2) benzylamine
 (3) p-nitroaniline (4) acetanilide

Q.16 The increasing order of stability of the following free radicals is - [AIEEE-2006]

- (1) $(\text{C}_6\text{H}_5)_3\dot{\text{C}} < (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{H} < (\text{CH}_3)_3\dot{\text{C}}$
 $< (\text{CH}_3)_2\dot{\text{C}}\text{H}$
 (2) $(\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{H} < (\text{C}_6\text{H}_5)_3\dot{\text{C}} < (\text{CH}_3)_3\dot{\text{C}}$
 $< (\text{CH}_3)_2\dot{\text{C}}\text{H}$
 (3) $(\text{CH}_3)_2\dot{\text{C}}\text{H} < (\text{CH}_3)_3\dot{\text{C}} < (\text{C}_6\text{H}_5)_3\dot{\text{C}}$
 $< (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{H}$
 (4) $(\text{CH}_3)_2\dot{\text{C}}\text{H} < (\text{CH}_3)_3\dot{\text{C}} < (\text{C}_6\text{H}_5)_2\dot{\text{C}}\text{H}$
 $< (\text{C}_6\text{H}_5)_3\dot{\text{C}}$

Q.17 $\text{CH}_3\text{Br} + \text{Nu}^- \rightarrow \text{CH}_3-\text{Nu} + \text{Br}^-$

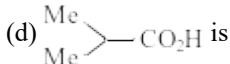
The decreasing order of the rate of the above reaction with nucleophiles (Nu^-) A to D is

$[\text{Nu}^- = (\text{A}) \text{PhO}^-, (\text{B}) \text{AcO}^-, (\text{C}) \text{HO}^-, (\text{D}) \text{CH}_3\text{O}^-]$

[AIEEE-2006]

- (1) $D > C > B > A$ (2) $A > B > C > D$
 (3) $B > D > C > A$ (4) $D > C > A > B$

Q.18 The correct order of increasing acid strength of the compounds- [AIEEE-2006]

- (a) $\text{CH}_3\text{CO}_2\text{H}$ (b) $\text{MeOCH}_2\text{CO}_2\text{H}$
 (c) $\text{CF}_3\text{CO}_2\text{H}$ (d)  is

- (1) $d < a < c < b$ (2) $d < a < b < c$
 (3) $a < d < c < b$ (4) $b < d < a < c$

Q.19 Which one of the following is the strongest base in aqueous solution ? [AIEEE-2007]

- (1) Trimethylamine (2) Aniline
 (3) Dimethylamine (4) Methylamine

Q.20 Presence of a nitro group in a benzene ring-

[AIEEE-2007]

- (1) activates the ring towards electrophilic substitution
 (2) renders the ring basic
 (3) deactivates the ring towards nucleophilic substitution
 (4) deactivates the ring towards electrophilic substitution

Q.21 Arrange the carbanions, $(\text{CH}_3)_3\text{C}^\ominus$, $\text{C}_6\text{H}_5\text{C}^\ominus\text{H}$, $(\text{CH}_3)_2\text{CH}^\ominus$, $\text{C}_6\text{H}_5\text{CH}_2^\ominus$, in order of their decreasing stability-

[AIEEE-2007]

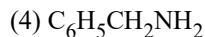
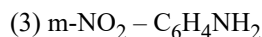
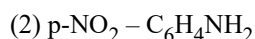
- (1) $(\text{CH}_3)_2\text{CH}^\ominus > \text{C}_6\text{H}_5\text{C}^\ominus\text{H} > \text{C}_6\text{H}_5\text{CH}_2^\ominus > (\text{CH}_3)_3\text{C}^\ominus$
 (2) $\text{C}_6\text{H}_5\text{C}^\ominus\text{H} > \text{C}_6\text{H}_5\text{CH}_2^\ominus > (\text{CH}_3)_2\text{CH}^\ominus > (\text{CH}_3)_3\text{C}^\ominus$
 (3) $(\text{CH}_3)_3\text{C}^\ominus > (\text{CH}_3)_2\text{CH}^\ominus > \text{C}_6\text{H}_5\text{CH}_2^\ominus > \text{C}_6\text{H}_5\text{C}^\ominus\text{H}$
 (4) $\text{C}_6\text{H}_5\text{CH}_2^\ominus > \text{C}_6\text{H}_5\text{C}^\ominus\text{H} > (\text{CH}_3)_3\text{C}^\ominus > (\text{CH}_3)_2\text{CH}^\ominus$

Q.22 An aromatic molecule will - [IIT - 1999]

- (1) have $4n$ π electrons
 (2) have $(4n + 2)$ π electrons
 (3) be planar
 (4) be cyclic

Q.23 Amongst the following, the most basic compound is - [IIT - 2000]

- (1) $\text{C}_6\text{H}_5\text{NH}_2$



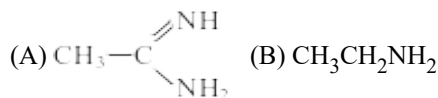
Q.24 Which of the following has the highest nucleophilicity ? [IIT - 2000]

- (1) F^\ominus (2) OH^\ominus
 (3) CH_3^\ominus (4) NH_2^\ominus

Q.25 Which of the following has the most acidic hydrogen ? [IIT - 2000]

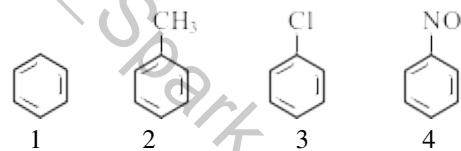
- (1) 3-Hexanone (2) 2,4-Hexanedione
 (3) 2,5-Hexanedione (4) 2,3-Hexanedione

Q.26 The correct order of basicities of the following compounds is - [IIT - 2001]



- (1) $\text{B} > \text{A} > \text{C} > \text{D}$ (2) $\text{A} > \text{C} > \text{B} > \text{D}$
 (3) $\text{C} > \text{A} > \text{B} > \text{D}$ (4) $\text{A} > \text{B} > \text{C} > \text{D}$

Q.27 Identify the correct order of reactivity in electrophilic substitution reaction of the following compounds- [IIT-2002]



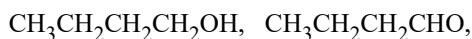
- (1) $1 > 2 > 3 > 4$ (2) $4 > 3 > 2 > 1$
 (3) $2 > 1 > 3 > 4$ (4) $2 > 3 > 1 > 4$

Q.28 Which of the following acids has the smallest dissociation constant - [IIT - 2002]

- (1) $\text{CH}_3\text{CHFCOOH}$
 (2) $\text{FCH}_2\text{CH}_2\text{COOH}$
 (3) $\text{BrCH}_2\text{CH}_2\text{COOH}$



Q.29 Identify the correct order of boiling points of the following compounds - [IIT - 2002]



(I) (II)

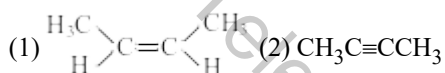


(III)

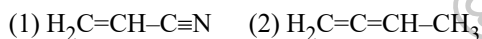
(1) $\text{I} > \text{II} > \text{III}$ (2) $\text{III} > \text{I} > \text{II}$

(3) $\text{I} > \text{III} > \text{II}$ (4) $\text{III} > \text{II} > \text{I}$

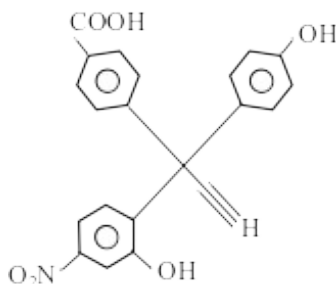
Q.30 Which of the following hydrocarbons has the lowest dipole moment - [IIT - 2002]



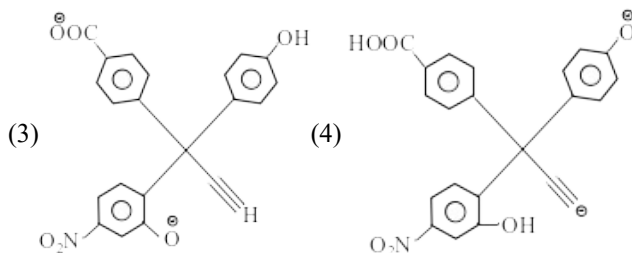
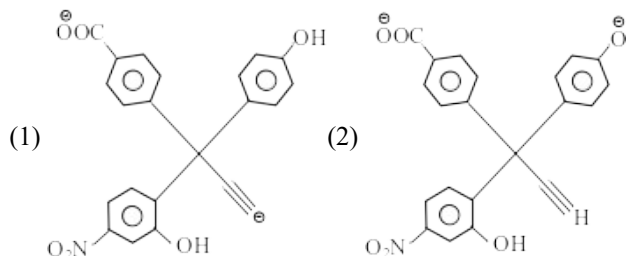
Q.31 Left to right sp^2 , sp^2 , sp , sp hybridization is present in - [IIT - 2003]



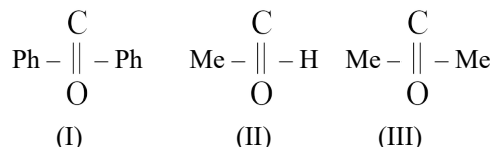
Q.32 [IIT - 2003]



when X is made to react with 2 eq. of NaNH_2 the product formed will be-

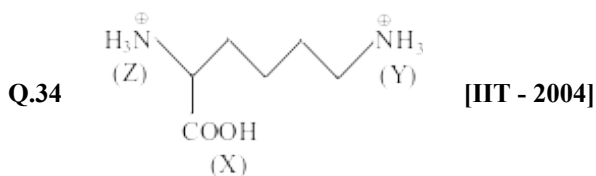


Q.33 Order of rate of reaction of following compound with phenyl magnesium bromide is - [IIT - 2004]



(1) $\text{I} > \text{II} > \text{III}$ (2) $\text{II} > \text{III} > \text{I}$

(3) $\text{III} > \text{I} > \text{II}$ (4) $\text{II} > \text{I} > \text{III}$



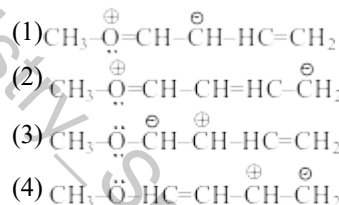
Correct order of acidic strength is :

(1) $x > y > z$ (2) $z > y > x$

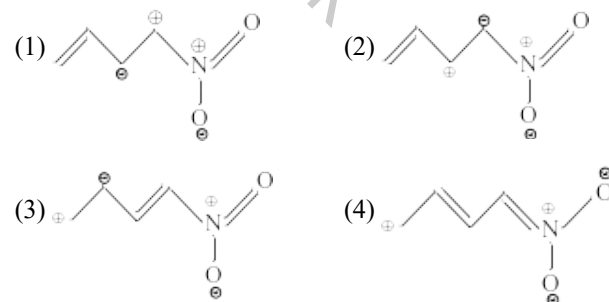
(3) $y > z > x$ (4) $x > z > y$

Q.35 Which of the following is least stable

[IIT - 2005]

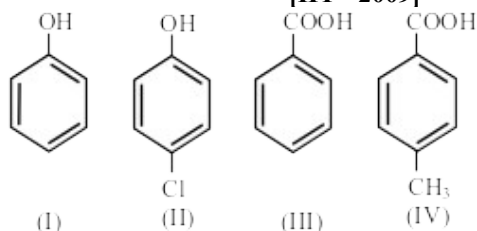


Q.36 Among the following, the least stable resonance structure is : [IIT - 2007]



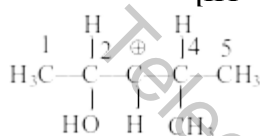
Q.37 The correct acidity order of the following is-

[IIT - 2009]



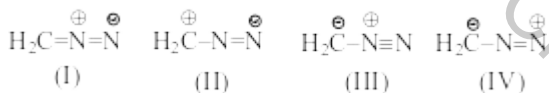
- (1) (III) > (IV) > (II) > (I)
 (2) (IV) > (III) > (I) > (II)
 (3) (III) > (II) > (I) > (IV)
 (4) (II) > (III) > (IV) > (I)

Q.38 In the following carbocation, H/CH₃ that is most likely to migrate to the positively charged carbon is -
 [IIT - 2009]



- (1) CH₃ at C-4
 (2) H at C-4
 (3) CH₃ at C-2
 (4) H at C-2

Q.39 The correct stability order of the following resonance structures is -
 [IIT - 2009]



- (1) (I) > (II) > (IV) > (III)
 (2) (I) > (III) > (II) > (IV)
 (3) (II) > (I) > (III) > (IV)
 (4) (III) > (I) > (IV) > (II)

Q.40 The correct order of increasing basicity of the given conjugate bases (R = CH₃) is -

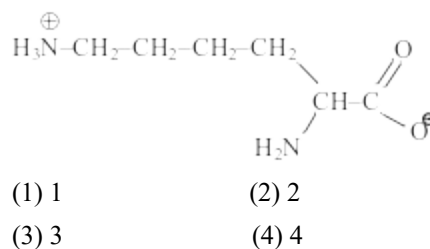
[AIEEE-2010]

- (1) RCOO⁻ < HC≡C⁻ < NH₂⁻ < R⁻
 (2) RCOO⁻ < HC≡C⁻ < R⁻ < NH₂⁻
 (3) R⁻ < HC≡C⁻ < RCOO⁻ < NH₂⁻
 (4) RCOO⁻ < NH₂⁻ < HC≡C⁻ < R⁻

Q.41 Out of the following the alkene that exhibits optical isomerism is
 [AIEEE-2010]

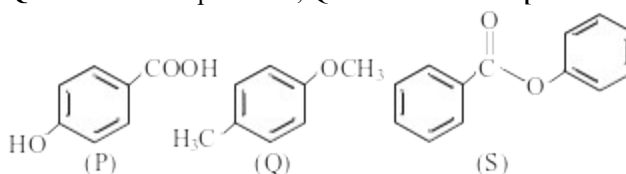
- (1) 2-methyl-2-pentene (2) 3-methyl-2-pentene
 (3) 4-methyl-pentene (4) 3-methyl-1-pentene

Q.42 The total number of basic groups in the following form of lysine is -
 [IIT-2010]

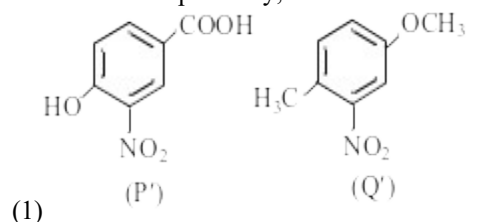


- (1) 1 (2) 2
 (3) 3 (4) 4

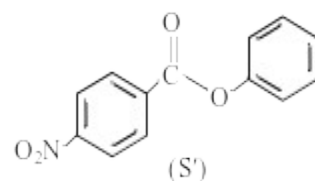
Q.43 The compounds P, Q and S [IIT-2010]



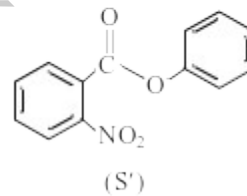
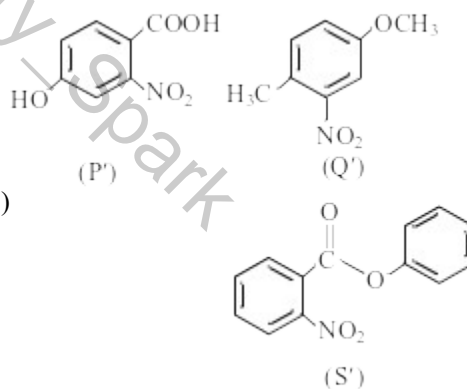
were separately subjected to nitration using HNO₃/H₂SO₄ mixture. The major product formed in each case respectively, is

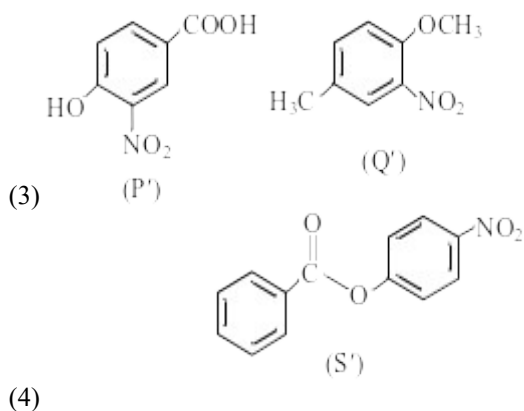


(1)



(2)





Q.46 The correct order of acid strength of the following compounds is : [AIEEE-2011]

- A. Phenol
 B. p-Cresol
 C. m-Nitrophenol
 D. p-Nitrophenol
 (1) $D > C > A > B$
 (2) $B > D > A > C$
 (3) $A > B > D > C$
 (4) $C > B > A > D$

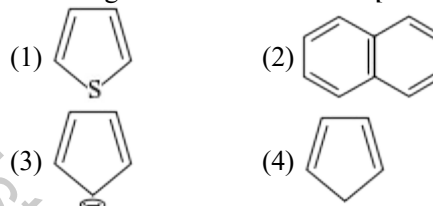
Q.44 The strongest acid amongst the following compounds is [AIEEE-2011]

- (1) CH_3COOH
 (2) HCOOH
 (3) $\text{CH}_3\text{CH}_2\text{CH}(\text{Cl})\text{CO}_2\text{H}$
 (4) $\text{ClCH}_2\text{CH}_2\text{CH}_2\text{COOH}$

Q.45 Consider thiol anion (RS^-) and alkoxy anion (RO^-). Which of the following statement is correct ? [AIEEE-2011]

- (1) RS^- is less basic but more nucleophilic than RO^-
 (2) RS^- is more basic and more nucleophilic than RO^-
 (3) RS^- is more basic but less nucleophilic than RO^-
 (4) RS^- is less basic and less nucleophilic than RO^-

Q.47 The non aromatic compound among the following is - [AIEEE-2011]



EXERCISE # 4

(ASSERTION – REASON TYPE QUESTIONS)

These questions consist of two statements each, printed as Assertion and Reason. While answering these Questions you are required to choose any one of the following four responses.

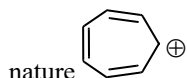
- (A) If both Assertion & Reason are true & the Reason is a correct explanation of the Assertion.
 (B) If both Assertion and Reason are true but Reason is not a correct explanation of the Assertion.
 (C) If Assertion is true but the Reason is false.
 (D) If Assertion & Reason both are false.

Q.1 **Assertion :** Carbanions like ammonia have pyramidal shape.

Reason : The carbon atom carrying negative charge has an octet of electrons.

- (1) A (2) B (3) C (4) D

Q.2 **Assertion :** Tropylium cation is aromatic in



Reason : The only property that determines its aromatic behaviour is its planar structure.

- (1) A (2) B (3) C (4) D

Q.3 **Assertion :** The potential energy barrier for rotation about C=C bond in 2-butene is much higher than that in ethylene.

Reason : Hyperconjugation effect decreases the double bond character.

- (1) A (2) B (3) C (4) D

Q.4 **Assertion :** Me_3C^+ is more stable than Me_2CH^+ and Me_2CH^+ is more stable than the MeCH_2^+ .

Reason : Greater the number of hyperconjugative structures, more is the stability of carbocation.

- (1) A (2) B (3) C (4) D

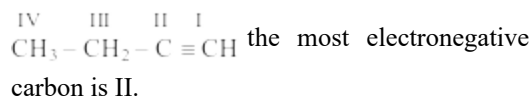
Q.5 **Assertion :** Cyclopentadienyl anion is much more stable than allyl anion.

(AIIMS-2005)

Reason : Cyclopentadienyl anion aromatic in nature

- (1) A (2) B (3) C (4) D

Q.6 **Assertion :** In the compound,



Reason : Carbon atom II has more s-character.

- (1) A (2) B (3) C (4) D

Q.7 **Assertion :** Bridgehead carbocation is stable while bridgehead carbanion is unstable.

Reason : Carbocation cannot be planar in bridgehead position while carbanion does not require planar configuration.

- (1) A (2) B (3) C (4) D

Q.8 **Assertion :** CH_3OCH_3 and $\text{C}_2\text{H}_5\text{OH}$ have comparable molecular masses but boiling point of $\text{C}_2\text{H}_5\text{OH}$ is higher than dimethyl ether.

Reason : $\text{C}_2\text{H}_5\text{OH}$ forms intermolecular H-bonding while CH_3OCH_3 forms intramolecular H-bonding.

- (1) A (2) B (3) C (4) D

Q.9 **Assertion :** Allyl carbocation is more stable than propyl carbocation.

Reason : Allyl carbocation has two sp^2 hybridised carbons.

- (1) A (2) B (3) C (D) 4

Q.10 **Assertion :** o-Hydroxybenzoic acid has intramolecular hydrogen bonding. [IIT - 2007]

Reason : p-Hydroxybenzoic acid has a lower boiling point than o-hydroxybenzoic acid.

- (1) A (2) B (3) C (4) D

Q.11 Assertion : Phenol is more reactive than benzene towards electrophilic substitution reaction. [IIT-2000]

Reason : In the case of phenol, the intermediate carbocation is more resonance stabilised.

(1) A (2) B (3) C (4) D

Q.12 Assertion : Tertiary carbocations are generally formed more easily than primary carbocations.

Reason : Hyperconjugation as well as inductive effect due to additional alkyl group stabilize tertiary carbocations.

(1) A (2) B (3) C (4) D

Q.13 Assertion : Allyl free radical is more stable than simple alkyl free radical.

Reason : The allyl free radical is stabilized by resonance.

(1) A (2) B (3) C (4) D

Q.14 Assertion : Nucleophiles attack the regions of high electron density.

Reason : Nucleophiles act as Lewis bases.

(1) A (2) B (3) C (4) D

Q.15 Assertion : Heterolytic fission involves the breaking of a covalent bond in such a way that both the electrons of the shared pair are carried away by one of the atoms.

Reason : Heterolytic fission occurs readily in polar covalent bonds.

(1) A (2) B (3) C (4) D

Q.16 Assertion : tert-Butoxide is a stronger base than OH^- or C_2H_5^- ion but is a much poorer nucleophile.

Reason : A negatively charged ion is always more powerful nucleophile than its conjugate acid.

(1) A (2) B (3) C (4) D

Q.17 Assertion : Formaldehyde is a planar molecule.

Reason : Carbon atom in formaldehyde is sp^2 -hybridized.

(1) A (2) B (3) C (4) D

Q.18 Assertion : The pK_a value of acetic acid is lower than that of phenol. (AIIMS-2004)

Reason : Phenoxide ion is more resonance stabilized than acetate ion.

(1) A (2) B (3) C (4) D

Q.19 Assertion : Pyrrole is a weaker base than its hydrogenated product pyrrolidine.

Reason : Lone pair of electrons on nitrogen are delocalized in pyrrole.

(1) A (2) B (3) C (4) D

Q.20 Assertion : The carbocation $\text{CF}_3-\text{CH}_2^+$ is less stable than CF_3^+ .

Reason : In case of $\text{CF}_3-\text{CH}_2^+$, the strongly electron withdrawing $-\text{CF}_3$ group intensifies the lone pairs of +ve charge but in case of CF_3^+ , the lone pairs of electron on each of the three F-atoms overlap with the empty p-orbital of the carbocation carbon atom, thereby dispersing the +ve charge.

(1) A (2) B (3) C (4) D

Q.21 Assertion : Methylene has sextet of electrons around carbon.

Reason : Methylene behaves as nucleophile.

(1) A (2) B (3) C (4) D

Q.22 Assertion : Acidity of the C-H bond decreases in the order

$\text{HC} \equiv \text{CH} > \text{CH}_2 = \text{CH}_2 > \text{CH}_3 - \text{CH}_3$

Reason : Acidity of the C-H bond increases as the electronegativity of the carbon to which it is attached increases.

(1) A (2) B (3) C (4) D

Q.23 **Assertion :** Benzyl chloride is more reactive than p-chloro toluene towards aqueous NaOH.
Reason : The C–Cl bond in benzyl chloride is more polar than C–Cl bond in p-chloro toluene.
(1) A (2) B (3) C (4) D

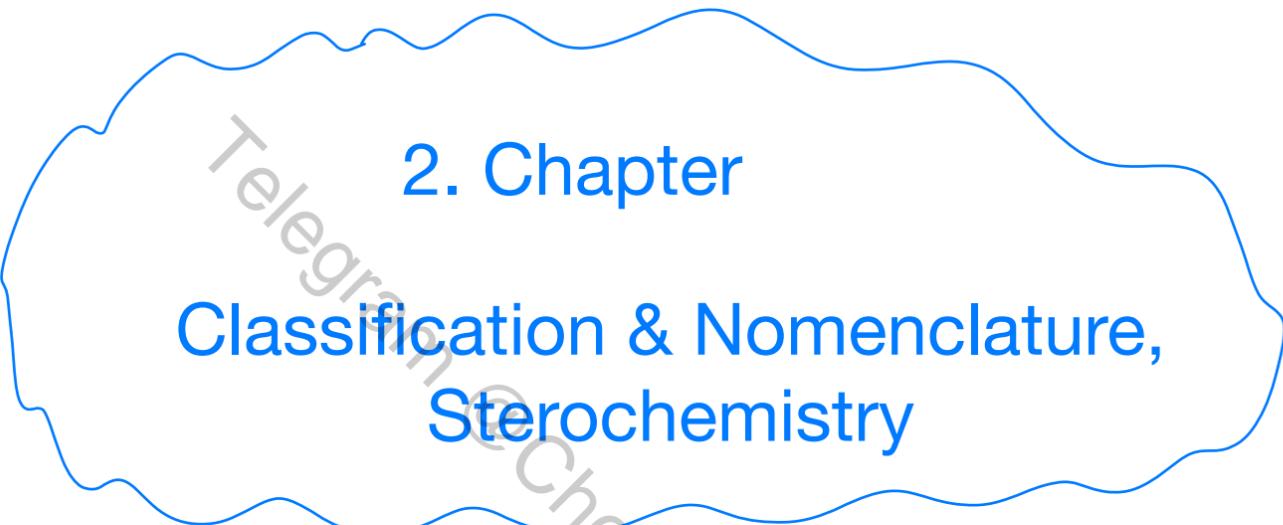
Q.24 **Assertion :** $\text{CH}_3\text{CH}_2\text{OCH}_2\text{Cl}$ reacts faster when treated with water than $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_2\text{CH}_2\text{Cl}$.
Reason : Carbonium ion formed by the ionisation of $\text{CH}_3\text{CH}_2\text{OCH}_2\text{Cl}$ is stabilized by resonance.
(1) A (2) B (3) C (4) D

Q.25 **Assertion :** p-Chloro aniline and anilinium hydrochloride can be distinguished by AgNO_3 .
Reason : p-Chloro aniline is less basic than aniline.
(1) A (2) B (3) C (4) D

Q.26 **Assertion :** Aniline is more reactive than acetanilide (PhNHCOMe) for electrophilic substitution.
Reason : Intermediate anion of aniline is more stable.
(1) A (2) B (3) C (4) D

Q. 27 **Assertion :** CHF_3 is less acidic than CHCl_3 .
Reaction : CCl_3^\oplus is more stable than CF_3^\oplus due to d-orbital resonance.
(1) A (2) B (3) C (4) D

Telegram @Chemistry_Spark



2. Chapter

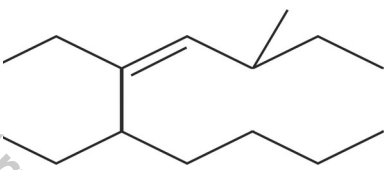
Classification & Nomenclature,
Stereochemistry

Telegram@Chemistry_Spark

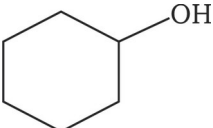
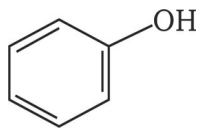
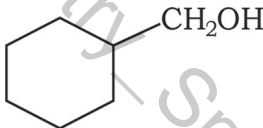
Level – 1

1. CLASSIFICATION AND NOMENCLATURE OF ORGANIC COMPOUNDS

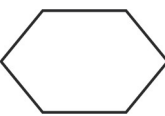
Multiple Choice Question

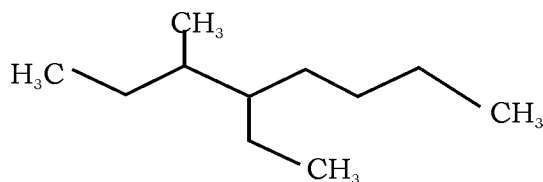
1. The IUPAC name of the compound $\begin{array}{c} \text{CH}_2 - \text{CH}_2 - \text{CH}_2 \\ | \quad | \quad | \\ \text{CN} \quad \text{CN} \quad \text{CN} \end{array}$ is
(a) 1, 2, 3-Tricyanopropane (b) 3-Cyanopentane-1,5-dinitrile
(c) Propane-1,2,3-tricarbonitrile (d) Propane-1,2,3-tricarbylamine
2. IUPAC name of the following compound $\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH}_2 - \text{CH}_3 \\ | \\ \text{Cyclohexyl} \end{array}$ is
(a) 1-(2-Butyl)cyclohexane (b) 1-(3-Butyl)cyclohexane
(c) 2-Cyclohexylbutane (d) 3-Cyclohexylbutane.
3. The compound which has one isopropyl group is
(a) 2, 2, 3, 3- Tetramethylpentane
(b) 2, 2-Dimethylpentane
(c) 2, 2, 3-Trimethylpentane
(d) 2-Methylpentane.
4. The correct IUPAC name of the compound  is
(a) 5, 6-Diethyl-8—methyldec-6-ene (b) 6-Butyl-5-ethyl-3-methyloct-4-ene
(c) 5,6-Diethyl-3-methyldec-4-ene (d) 2,4,5-Triethylnon-3-ene
5. An organic compound X (molecular formula $\text{C}_6\text{H}_7\text{O}_2\text{N}$) has six carbon atoms in a ring system, two double bonds and a nitro group as substituent, X is
(a) Homocyclic but not aromatic (b) Aromatic but not homocyclic
(c) Homocyclic and aromatic (d) Heterocyclic and aromatic
6. 2-Methyl-2-butene will be represented as
(a) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3 - \text{CH} - \text{CH}_2 - \text{CH}_3 \end{array}$ (b) $\begin{array}{c} \text{CH}_3 - \text{C} = \text{CH} - \text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$
(c) $\begin{array}{c} \text{CH}_3 - \text{CH}_2 - \text{C} = \text{CH}_2 \\ | \\ \text{CH}_3 \end{array}$ (d) $\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH} = \text{CH}_2 \\ | \\ \text{CH}_3 \end{array}$
7. The IUPAC name of $\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH} = \text{C} - \text{CHO} \\ | \quad \quad | \\ \text{OH} \quad \quad \text{CH}_3 \end{array}$ is
(a) 4-Hydroxy-1-methylpentanal
-

- (b) 4-Hydroxy-2-methylpent-2-en-1-al
 (c) 2-Hydroxy-4-methylpent-3-en-5-al
 (d) 2-Hydroxy-3-methylpent-2-en-5-al

8. The IUPAC name of $\text{CH}_3 - \text{C} \equiv \text{C} - \text{CH}(\text{CH}_3)_2$ is
 (a) 4-Methyl-2-pentyne (b) 4,4'-Demethyl-2-butyne
 (c) Isopropylmethylacetylene (d) 2-Methyl-4-pentyne.
9. The kind of valency that exists in CaH_2 and C_2H_2 is?
 (a) Electrovalency in CaH_2 and covalency in C_2H_2
 (b) Electrovalency in both
 (c) Covalency in CaH_2 and electrovalency in C_2H_2
 (d) Covalency in both.
10. Which of the following IUPAC names is correct ?
 (a) 2-Methyl-3-ethylpentane (b) 3-Ethyl-2-methylpentane
 (c) 2-Ethyl-3-methylpentane (d) 3-Methyl-2-ethylpentane.
11. The IUPAC name of $\text{OHC} - \text{CH} = \text{CH} - \underset{\substack{| \\ \text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3}}{\text{CH}} - \text{CH} = \text{CH}_2$ is
 (a) 5-Vinyloct-3-en-1-al (b) 4-Butyl-2,5-hexadien-1-al
 (c) 5-Vinyloct-5-en-8-al (d) 3-Butyl-1,4-hexadien-8-al.
12. The structural formula of cyclohexyl alcohol is
 (a)  (b)  (c)  (d) None of these
13. IUPAC name of $(\text{CH}_3)_2\text{CH} - \text{CH}_2 - \text{CH}_2\text{Br}$ is
 (a) 1-Bromopentane (b) 2-Methyl-4-bromobutane
 (c) 1-Bromo-3-methylbutane (d) 2-Methyl-3-bromopropane.
14. The IUPAC name of the compound $\text{CH}_3 - \underset{\substack{| \\ \text{OH}}}{\text{CH}} - \text{CH}_2 - \underset{\substack{| \\ \text{OH}}}{\overset{\substack{\text{CH}_3 \\ |}}{\text{C}}} - \text{CH}_3$ is
 (a) 1,1-Dimethylbutane-1,3-diol (b) 1,3,3-Trimethylpropane-1,3-diol
 (c) 2-Methylpentane-2,4-diol (d) 1,3,3-Trimethyl-1,3-propanediol.
15. The IUPAC name of $(\text{CH}_3)_3\text{C} - \text{CH} = \text{CH}_2$ is
 (a) 2,2-Dimethylbut-3-ene (b) 2,2-Dimethylpent-4-ene
 (c) 3,3-Dimethylbut-1-ene (d) Hex-1-ene.

16. IUPAC name for the compound $\begin{array}{c} \text{Cl} \\ \diagdown \\ \text{C} = \text{C} \diagup \text{CH}_2\text{CH}_3 \\ \diagup \text{H}_3\text{C} \quad \diagdown \text{I} \end{array}$ is
 (a) *trans*-2-Chloro-3-iodopentene-2
 (b) *cis*-2-Chloro-3-iodo-2-pentene
 (c) *trans*-3-Iodo-4-chloro-3-Pentene
 (d) *cis*-3-Iodo-4-chloro-3-pentene.
17. The IUPAC name for the formula, $\begin{array}{c} \text{CH}_3\text{H} \\ | \quad | \\ \text{CH}_3 - \text{C} = \text{C} - \text{COOH} \end{array}$ is
 (a) 2-Methyl-2-butenic acid (b) 3-Methyl-3-butenic acid
 (c) 3-Methyl-2-butenic acid (d) 2-Methyl-3-butenic acid.
18. The IUPAC name of $\begin{array}{c} \text{CH}_3 - \text{C} = \text{C} - \text{CH} - \text{CH}_2 - \text{C} \equiv \text{CH} \\ | \quad | \quad | \\ \text{Cl} \quad \text{CH}_3 \quad \text{C}_2\text{H}_5 \end{array}$ is
 (a) 6-Chloro-4-ethyl-5-methylhept-5-en-1-yne
 (b) 6-Chloro-4-ethyl-5-methylhept-1-yn-5-ene
 (c) 2-Chloro-4-ethyl-3-methylhept-2-en-6-yne
 (d) 2-Chloro-4-ethyl-3-methylhept-6-yn-2-ene
19. The IUPAC name of the compound having the molecular formula $\text{Cl}_3\text{C}-\text{CH}_2\text{CHO}$ is
 (a) 3,3,3-Trichloropropanal (b) 1,1,1-Trichloropropanal
 (c) 2,2,2-Trichloropropanal (d) Chloral.
20. The IUPAC name of $\begin{array}{c} \text{O} \quad \text{OH} \\ || \quad | \\ \text{CH}_3 - \text{C} - \text{CH}_2 - \text{CH} - \text{CHO} \end{array}$ is
 (a) 5-Oxo-4-hydroxy-2-pentanone (b) 4-Hydroxy-5-oxo-2-pentanone
 (c) 2-Hydroxy-4-oxopentanal (d) 1-Al-4-oxo-2-pentanol.
21. The IUPAC name of $\begin{array}{c} \text{H} \quad \text{C}_4\text{H}_9 \\ | \quad | \\ \text{CH}_3\text{CH}_2 - \text{C} - \text{C} - \text{CH}_3 \\ | \quad | \\ \text{H}_3\text{C} \quad \text{CH}_3 \end{array}$ is
 (a) 3,4,4-Trimethylheptane (b) 3,4,4-Trimethyloctane
 (c) 2-Butyl-2-methyl-3-ethylbutane (d) 2-Ethyl-3, 3-dimethylheptane.
22. The IUPAC name of $\text{CH}_3\text{CH}=\text{CHCOOC}_2\text{H}_5$ is
 (a) Ethyl but-1-enoate (b) Ethyl but 2-enoate
 (c) Ethyl prop-2-enoate (d) None of these.

-
23. The IUPAC name of  is
- (a) Cyclohexanone (b) Cyclohexylmethanone
(c) Oxycyclohexene (d) Cyclohexylidenemethanone
24. IUPAC name of $\text{CH}_2=\text{CHCN}$ is
- (a) Ethenenitrile (b) Vinyl cyanide
(c) Cyanoethene (d) 2-Propenenitrile
25. Vinylcarbinol is
- (a) $\text{HO}-\text{CH}_2-\text{CH}=\text{CH}_2$ (b) $\text{CH}_3\text{CH}(\text{OH})=\text{CH}_2$
(c) $\text{CH}_3-\text{CH}=\text{CH}-\text{OH}$ (d) $\text{CH}_3-\text{C}(\text{CH}_2\text{OH})=\text{CH}_2$
26. The correct IUPAC name of $\text{H}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{CHO}$ is
- (a) Formylmethanal (b) 1,2-Ethanedione
(c) 2-Oxoethanal (d) 1,2-Ethanedial.
27. The IUPAC name of the following $\text{CH}_3\text{C}(\text{CH}_3)_2\text{CH}_2\text{CH}=\text{CH}_2$ is
- (a) 2,2-Dimethyl-4-pentene (b) 4,4,-Dimethyl-1-pentene
(c) 1,1,1-Trimethyl-3-butene (d) 4,4,4-Trimethyl-1-butene
28. Which of the following compound has wrong IUPAC name?
- (a) $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{COO}-\text{CH}_2\text{CH}_3$
ethylbutanoate
- (b) $\text{CH}_3-\underset{\text{CH}_3}{\underset{|}{\text{CH}}}-\text{CH}_2-\text{CHO}$
3-methylbutanal
- (c) $\text{CH}_3-\underset{\text{OH}}{\underset{|}{\text{CH}}}-\underset{\text{CH}_3}{\underset{|}{\text{CH}}}-\text{CH}_3$ 2-methyl-3-butanol
- (d) $\text{CH}_3-\underset{\text{CH}_3}{\underset{|}{\text{CH}}}-\underset{\text{O}}{\underset{|}{\text{C}}}-\text{CH}_2-\text{CH}_3$
2-methyl-3-pentanone
29. The IUPAC name of $\text{CH}_3\text{COCH}(\text{CH}_3)_2$ is
- (a) 2-methyl-3-butanone (b) 4-methylisopropyl ketone
(c) 3-methyl-2-butanone (d) Isopropyl methyl ketone.
30. Name of the compound given below is
-



- (a) 4-ethyl-3-methyloctane (b) 3-methyl-4-ethyloctane
(c) 2, 3-diehyloheptane (d) 5-ethyl-6-methyloctane

2. PURIFICATION AND CHARACTERIZATION OF ORGANIC COMPOUNDS

- If two compounds have the same empirical formula but different molecular formulae, they must have
(a) different percentage composition (b) different molecular weights
(b) same viscosity (d) same vapour density.
 - Soda-lime test is used to detect the following element in an organic compound?
(a) C (b) H (c) N (d) S
 - Lassaigne's test is used in qualitative analysis to detect
(a) Nitrogen (b) Sulphur (c) Chlorine (d) All of these.
 - If on adding FeCl_3 solution to acidified Lassaigne's solution, a blood red colouration is produced, it indicates the presence of
(a) S (b) N (c) N and S (d) S and Cl.
 - Kjeldahl's method is used in the estimation of
(a) Nitrogen (b) Halogens (c) Sulphur (d) Oxygen.
 - In sodium fusion test of organic compounds, the nitrogen of the organic compound is converted into
(a) Sodamide (b) Sodium cyanide
(c) Sodium nitrite (d) Sodium nitrate
 - Two elements X (atomic weight = 75) and Y (atomic weight = 16) combine to give a compound having 75.8% X. The formula of the compound is
(a) XY (b) X_2Y (c) X_2Y_2 (d) X_2Y_3 .
 - Lassaigne's test for the detection of nitrogen fails in
(a) $\text{NH}_2\text{CONHNH}_2 \cdot \text{HCl}$ (b) $\text{NH}_2\text{NH}_2 \cdot \text{HCl}$.
(b) NH_2CONH_2 (d) $\text{C}_6\text{H}_5\text{NHNH}_2 \cdot \text{HCl}$.
 - The most suitable method for separation of a 1:1 mixture of ortho and para-nitrophenols is
-

-
- (a) Sublimation (b) Chromatography
(c) Crystallization (d) Steam distillation
10. The compound that does not give a blue colour in Lassaigne's test is
(a) Aniline (b) Glycine (c) Hydrazine (d) Urea
11. The Lassaigne's extract is boiled with dil HNO_3 before testing for halogens because
(a) Silver halides are soluble in HNO_3
(b) Na_2S and NaCN are decomposed by HNO_3
(c) Ag_2S is Soluble in HNO_3
(d) AgCN is soluble in HNO_3
12. Dumas method involves the determination of nitrogen content in the organic compound in form of
(a) NH_3 (b) N_2 (c) NaCN (d) $(\text{NH}_4)_2\text{SO}_4$
13. If a compound on analysis was found to contain C = 18.5%, H=1.55%, Cl=55.04% and O=24.81%, then its empirical formula is
(a) CHClO (b) CH_2ClO (c) $\text{C}_2\text{H}_2\text{OCl}$ (d) ClCH_2O
14. A compound with empirical formula CH_2O has a vapour density of 30. Its molecular formula is
(a) $\text{C}_2\text{H}_2\text{O}_2$ (b) $\text{C}_2\text{H}_4\text{O}_2$ (c) $\text{C}_3\text{H}_6\text{O}_3$ (d) $\text{C}_6\text{H}_{12}\text{O}_6$
15. Molecular mass of a volatile substance may be obtained by
(a) Kjeldahl's method (b) Duma's method
(c) Victor- Meyer's method (d) Liebig's method
16. The Belstein test for organic compounds is used to detect
(a) Nitrogen (b) Sulphur (c) Carbon (d) Halogens
17. Which of the following compounds does not show Lassaigne's test for nitrogen ?
(a) Urea (b) Hydrazine
(c) Phenylhydrazine (d) Azobenzene
18. Percentage of Se (at.wt = 78.4) in peroxidase anhydrase enzyme is 0.5% by weight, then minimum molecular weight of peroxidase anhydrase enzyme is
(a) 1.568×10^4 (b) 1.568×10^3 (c) 15.68 (d) 2.136×10^4
19. In a compound of C, H and N atoms are present in 9:1:3.5 by weight. If molecular weight of the compound is 108, then molecular formula of the compound is
(a) $\text{C}_2\text{H}_6\text{N}_2$ (b) $\text{C}_3\text{H}_4\text{N}$ (c) $\text{C}_6\text{H}_8\text{N}_2$ (d) $\text{C}_9\text{H}_{12}\text{N}_3$
-

-
20. 0.833 mole of a carbohydrate with empirical formula CH_2O has 10 gram of hydrogen. What is its molecular formula?
(a) $\text{C}_5\text{H}_{10}\text{O}_5$ (b) $\text{C}_6\text{H}_{12}\text{O}_6$ (c) $\text{C}_3\text{H}_4\text{O}_3$ (d) $\text{C}_6\text{H}_{12}\text{O}_5$
21. Which of the following statements is wrong?
(a) Using Lassaigne's test nitrogen and sulphur present in an organic compound can be tested
(b) Using Beilstein's test, the presence of halogen in a compound can be tested.
(c) In Lassaigne's filtrate, the nitrogen present in the organic compound is converted into NaCN .
(d) Lassaigne's test fails to identify nitrogen in diazo compound.
(e) In the estimation of carbon, an organic compound is heated with CaO in a combustion tube.
22. Sublimation cannot be used for purification of
(a) Urea (b) Camphor (c) Benzoic acid (d) Naphthalene
23. Beilstein's test is answered by
(a) Halogens (b) Pyridine (c) Thiourea (d) All the above.
24. 0.532 g of the chloroplatinate of an organic base (mol.wt.244) gave 0.195 g of Pt on ignition. Then the number of nitrogen atoms per molecule of the base is
(a) 1 (b) 2 (c) 3 (d) 4
25. Complete combustion of a sample of a hydrocarbon gives 0.66 g of CO_2 and 0.36 g of H_2O . The empirical formula of the compound is
(A) CH_2 (b) C_3H_4 (c) C_3H_8 (d) C_6H_g
26. Two organic compounds A and B, both containing only C and H yield, On analysis, the same percentage composition by weight :
 $\text{C} = (12/13) \times 100\%$ and $\text{H} = (1/13) \times 100\%$ A decolourises Br_2 - water but B does not. Identity A and B
(a) $\text{A} = \text{C}_2\text{H}_2$, $\text{B} = \text{C}_6\text{H}_6$ (b) $\text{A} = \text{C}_6\text{H}_6$, $\text{B} = \text{C}_2\text{H}_2$
(c) $\text{A} = \text{C}_2\text{H}_4$, $\text{B} = \text{C}_2\text{H}_6$ (d) $\text{A} = \text{C}_2\text{H}_2$, $\text{B} = \text{C}_3\text{H}_8$
27. Complete combustion of 0.858 of compound X gives 2.63 g of CO_2 and 1.28 g of H_2O . The lowest molecular weight, X can have is
(a) 43 (b) 86 (c) 129 (d) 172
-

3. ISOMERISM AND STEREOCHEMISTRY OF ORGANIC COMPOUNDS

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-
1. The maximum number of isomers for an alkene with the molecular formula C_4H_8 is
(a) Two (b) Three (c) Four (d) Five
 2. How many chain isomers could be obtained from the alkane C_6H_{14} ?
(a) Four (b) Five (c) Six (d) Seven
 3. The number of structural and configurational isomers of a bromo compound, C_5H_9Br , formed by the addition of HBr to 2-pentyne respectively are
(a) 1 and 2 (b) 2 and 4 (c) 4 and 2 (d) 2 and 1
 4. Which of the following is an optically active compound?
(a) 1-Butanol (b) 1-Propanol
(c) 2-Chlorobutane (d) 4-Hydroxyheptane
 5. Which one of the following can exhibit cis-trans isomerism?
(a) $CH_3-CHCl-COOH$ (b) $H-C \equiv C-Cl$
(c) $ClCH=CHCl$ (d) $ClCH_2-CH_2Cl$.
 6. Which of the following will have least hindered rotation about carbon-carbon bond?
(a) Ethane (b) Ethylene (c) Acetylene (d) Hexachloroethane
 7. How many chiral carbon atoms are present in 2,3,4-trichloropentane ?
(a) Three (b) Two (c) One (d) Four
 8. Isomers of a substance must have the same
(a) Structural formula (b) Physical properties
(c) Chemical properties (d) Molecular formula
 9. An organic molecule necessarily shows optical activity if it
(a) contains asymmetric carbon atoms
(b) is non-polar
(c) is non-superimposable on its mirror image
(d) is superimposable on its mirror image.
 10. The stability of the compounds
-



(i)



(ii)



(iii)



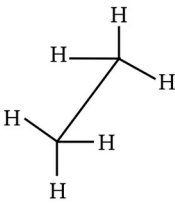
(iv)

(a) (iv) > (iii) > (i) > (ii)

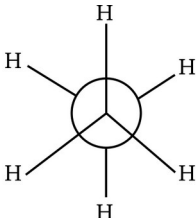
(c) (ii) > (iii) > (i) > (iv)

(b) (i) > (iii) > (ii) > (iv)

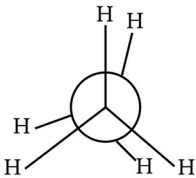
(d) (iv) > (i) > (iii) > (ii)

11. An organic compound C_4H_8O , is found to be optically active. Which of the following could it be ?
 (a) $CH_3 - CO - CH_2 - CH_3$ (b) $CH_3 - CH_2 - CH_2 - CHO$
 (c) $(CH_3)_2CH - CHO$ (d) $CH_2 = CH - CH(OH) - CH_3$
12. One recently discovered allotrope of carbon (e.g. C_{60}) is commonly known as
 (a) Flourine (b) Fullerene (c) Flourene (d) Freon.
13. Which one of the following is the stablest structure of cyclohexatriene ?
 (a) Chair form (b) Boat form (c) Half chair form (d) Planar form
14. How many structural isomers are there of $C_4H_{10}O$ that are ethers?
 (a) 1 (b) 3 (c) 2 (d) 4
15. Which organic structure among the following is not an isomer of the compound $CH_3 - CO - CH_2CH_2CH_2CH_3$?
 (a) $CH_3CH_2OCH = CHCH_2CH_3$ (b) $CH_3CH = CHCH_2CH_2CHO$
 (c) $(CH_3)_2CH - CO - CH_2CH_3$ (d) $CH_3CH_2COCH_2CH_2CH_3$.
16. In the following structures, which two forms are staggered conformation of ethane ?
- 

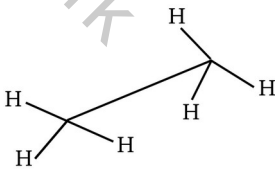
(1)



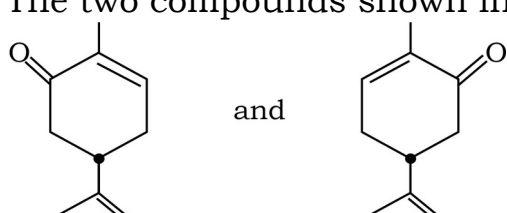
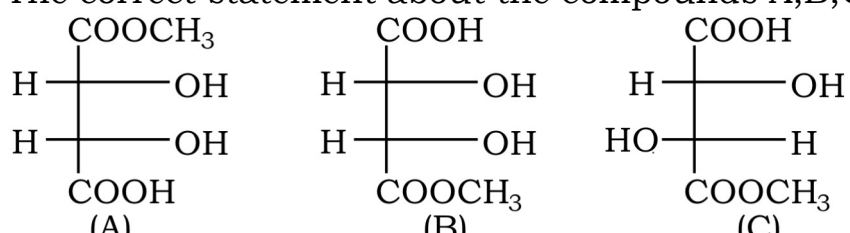
(2)

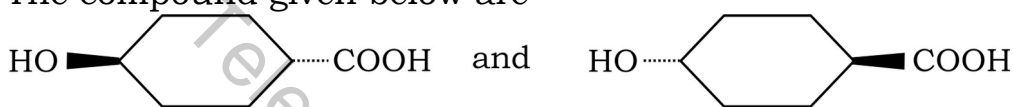


(3)



(4)
- (a) 1 and 4 (b) 2 and 3 (c) 1 and 2 (d) 1 and 3
17. meso -Tartaric acid is optically inactive due to the presence of
 (a) Molecular symmetry (b) Molecular asymmetry
 (c) External compensation (d) Two asymmetric carbon atoms.

18. The process of separation of racemic modification into-d-and-l-enantiomers is called
 (a) Resolution (b) Dehydration
 (c) Revolution (d) Dehydrohalogenation
19. The most stable conformation of ethylene glycol is
 (a) Anti (b) Gauche (c) Partially eclipsed (d) Fully eclipsed
20. In the reaction, $\text{CH}_3\text{CHO} + \text{HCN} \rightarrow \text{CH}_3\text{CH}(\text{OH})\text{CN}$, a chiral centre is produced. This product would be
 (a) Laevorotatory (b) Meso-compound
 (c) Dextrorotatory (d) Racemic mixture
21. Which of the following has zero dipole moment ?
 (a) cis -2-Butene (b) trans -2-Butene
 (c) 1-Butene
22. How many
 (a) 2
23. The total
 (a) 5 (b) 6 (c) 7 (d) 8
24. The two compounds shown in the figure below are

 (a) Diastereomers (b) Enantiomers
 (c) Epimers (d) Regiomers
25. The number of possible enantiomeric pairs that can be produced during monochlorination of 2-methylbutane is
 (a) 2 (b) 3 (c) 4 (d) 1
26. The correct statement about the compounds A,B,C

 (a) A and B are identical (b) A and B are diastereomers
 (c) A and C are enantiomers (d) A and B are enantiomers

27. How many optically active stereoisomers are possible for butane-2, 3-diol ?
 (a) 1 (b) 2 (c) 3 (d) 4
28. The isomers which can be converted into another form by rotation of the molecule around single bond are
 (a) Geometrical isomers (b) Conformers
 (c) Enantiomers (d) Diastereomers
29. The most stable conformation of n-butane is
 (a) skew-boat (b) Eclipsed (c) Gauche (d) Staggered-antill
30. The compound given below are
 and
 (a) Enantiomers (b) Identical
 (c) Regiomers (d) Diastereomers

4. SOME BASIC PRINCIPLES OF ORGANIC CHEMISTRY AND REACTION MECHANISM

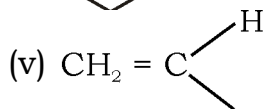
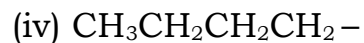
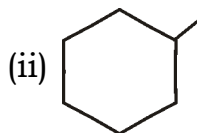
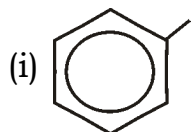
1. Which of the following contains three pairs of electrons in the valence shell ?
 (a) Carbocations (b) Carbanions (c) Free radicals (d) None.
2. The bonds between carbon atom (1) and carbon atom (2) in compound $\text{N} \equiv \overset{1}{\text{C}} - \overset{2}{\text{CH}} = \overset{3}{\text{CH}_2}$ involves the hybrid as
 (a) sp^2 and sp^2 (b) sp^3 and sp (c) sp and sp^2 (d) sp and sp
3. The $\text{Cl}-\text{C}-\text{Cl}$ angle in 1, 1, 2, 2-tetrachloroethene and tetrachloromethane respectively will be about
 (a) 120° and 109.5° (b) 90° and 109.5°
 (c) 109.5° and 90° (d) 109.5° and 120°
4. The formation of cyanohydrin from a ketone is an example of
 (a) Electrophilic addition (b) Nucleophilic addition
 (c) Nucleophilic substitution (d) Electrophilic substitution
5. Which of the following possesses a sp -carbon in its structure?
 (a) $\text{CH}_2=\text{CCl}-\text{CH}=\text{CH}_2$ (b) $\text{CCl}_2=\text{CCl}_2$
 (c) $\text{CH}_2=\text{C}=\text{CH}_2$ (d) $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2$
6. The compound in which C uses only its sp^3 - hybrid orbitals for bond formation is

(a) HCOOH (b) (H₂N)₂CO (c) (CH₃)₃COH (d) CH₃CHO

7. The enolic form of acetone contains
(a) Nine σ – bonds, one π – bond and two lone pairs
(b) Eight σ – bonds, two π – bonds and two lone pairs
(c) Nine σ – bonds, one π – bond and lone pair
(d) Nine σ – bonds, two π – bonds and one lone pair.
8. The shortest C-C bond distance is found in
(a) Diamond (b) Ethane (c) Benzene (d) Acetylene
9. The C-C bond length of the following molecules is in the order:
(a) C₂H₆ > CH₄ > C₆H₆ > C₂H₂ (b) C₂H₂ < C₂H₄ < C₆H₆ < C₂H₆
(c) C₂H₆ > C₂H₂ > C₆H₆ > C₂H₄ (d) C₂H₄ > C₂H₆ > C₂H₂ > C₆H₆.
10. The hybridization of carbon atoms in C-C single bond of HC \equiv C – CH = CH₂ is
(a) sp³-sp³ (b) sp²-sp³ (c) sp-sp² (d) sp³-sp.
11. Number of π -electrons in cyclobutadienyl anion (C₄H₄)²⁻ is
(a) 2 (b) 4 (c) 6 (d) 8
12. A straight chain hydrocarbon has the molecular formula C₈H₁₀. The hybridization of the carbon atoms from one end of the chain to the other are respectively sp³, sp², sp², sp³, sp², sp², sp and sp. The structural formula of the hydrocarbon would be :
(a) CH₃C \equiv CCH₂ – CH = CHCH = CH₂ (b) CH₃CH₂–CH= CHCH=CHC \equiv CH
(c) CH₃CH=CHCH₂–C \equiv CCH=CH₂ (d) CH₃CH = CHCH₂ –CH = CHC \equiv CH
13. Homolytic fission of C-C bond in ethane gives an intermediate in which carbon is
(a) sp³-hybridised (b) sp²-hybridised
(c) sp-hybridised (d) sp²d- hybridised
14. Which of the following is the most stable carbocation (carbonium ion) ?
(a) CH₃CH₂⁺ (b) (CH₃)₂CH⁺ (c) (CH₃)₃C⁺ (d) C₆H₅CH₂⁺.
15. Which one of the following has the smallest heat of hydrogenation per mole?
(a) 1-Butene (b) *trans*-2-Butene
(c) *cis*-2-Butene (d) 1, 3-Butadiene.
16. Which is the correct symbol relating the two Kekule structures of benzene?
-

(a) \square (b) \rightarrow (c) \equiv (d) \leftrightarrow

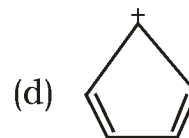
17. When the hybridization state of carbon atom changes from sp^3 to sp^2 and finally to sp , the angle between the hybridized orbitals
(a) decreases gradually (b) decreases considerably
(c) is not affected (d) increases progressively
18. The maximum number of carbon atoms arranged linearly in the molecule, $CH_3-C\equiv C-CH=CH_2$ is
(a) 5 (b) 4 (c) 3 (d) 2
19. The kind of delocalization involving sigma bond orbitals is called
(a) Inductive effect (b) Hyperconjugation effect
(c) Electromeric effect (d) Mesomeric effect
20. Which of the following statements is false about resonance contribution structures ?
(a) Contributing structures contribute to the resonance hybrid in proportion of their relative energies
(b) Equivalent contributing structures make the resonance very important
(c) Contributing structures represent molecules having no real existence
(d) Contributing structures are less stable than the resonance hybrid
21. In which of the compounds given below is there more than one kind of hybridization (sp , sp^2 , sp^3) for carbon?
(i) $CH_3CH_2CH_2CH_3$ (ii) $CH_3CH=CHCH_3$
(iii) $CH_2=CH-CH=CH_2$ (iv) $H-C\equiv C-H$
(a) (ii) (b) (iii) and (iv) (c) (i) and (iv) (d) (ii) and (iii).
22. Examine the following chemical structures to which simple functional groups are often attached.

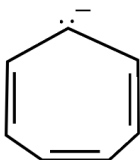
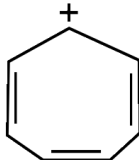
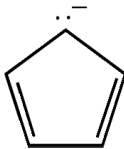
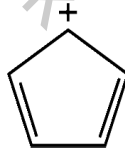


Which of these systems have essentially planar geometry?

- (a) (i) and (v) (b) (ii) and (iii) (c) (ii), (iii) and (iv) (d) (iv)

23. Which of the following will show aromatic behaviour ?
-



24. The bond length between sp^3 -hybridized carbon and other carbon atom is minimum in
(a) Propane (b) Propyne (c) Propene (d) Butane
25. The order of decreasing stability of the carbanions $(CH_3)_3C^-$ (I); $(CH_3)_2CH^-$ (II); $CH_3CH_2^-$ (III); $C_6H_5CH_2^-$ (IV) is.
(a) I > II > III > IV (b) IV > III > II > I
(c) IV > I > II > III (d) I > II > IV > III
26. The reaction, $CH_2=CH-CH_3 + HBr \rightarrow CH_3CHBr-CH_3$ is
(a) Nucleophilic addition (b) Electrophilic substitution
(c) Electrophilic addition (d) Free radical addition
27. Electrophile in the case of chlorination of benzene in presence of $FeCl_3$ is
(a) Cl^+ (b) Cl^- (c) Cl (d) $FeCl_3$
28. The cylindrical shape of alkynes is due to
(a) three sigma C—C bonds (b) three π C—C bonds
(c) two σ C—C and one π C—C bonds
(d) one sigma C—C and two π C—C bonds
29. Which of the following species would be expected to exhibit aromatic character? Select the correct answer from the following:
- I.  II.  III.  IV. 
- (a) I and IV (b) II and IV (c) I and III (d) II and III
30. Which of the following is correct regarding the -I-effect of the substituents?
(a) $-NR_2 < -OR < -F$ (b) $-NR_2 > -OR < -F$
(c) $-NR_2 < -OR > -F$ (d) $-NR_2 > -OR > -F$

Answer Keys

1. CLASSIFICATION AND NOMENCLATURE OF ORGANIC COMPOUNDS

Answer Key

Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.
1.	c	11.	b	21.	b
2.	a	12.	a	22.	b
3.	d	13.	c	23.	d
4.	c	14.	c	24.	d
5.	b	15.	c	25.	a
6.	b	16.	a	26.	d
7.	b	17.	c	27.	b
8.	a	18.	a	28.	c
9.	a	19.	a	29.	c
10.	b	20.	c	30.	a

2. PURIFICATION AND CHARACTERIZATION OF ORGANIC COMPOUNDS

Answers Key

Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.
1.	B	11.	B	21.	E
2.	C	12.	B	22.	A
3.	D	13.	A	23.	D
4.	C	14.	B	24.	D
5.	A	15.	C	25.	C
6.	B	16.	D	26.	A
7.	D	17.	B	27.	A
8.	B	18.	A		
9.	D	19.	C		
10.	C	20.	A		

3. ISOMERISM AND STEREOCHEMISTRY OF ORGANIC COMPOUNDS

Answer Key

Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.
1.	c	11.	d	21.	b
2.	b	12.	b	22.	b
3.	b	13.	d	23.	b
4.	c	14.	b	24.	b
5.	c	15.	b	25.	a
6.	a	16.	c	26.	d
7.	a	17.	a	27.	b
8.	d	18.	a	28.	b
9.	c	19.	b	29.	d
10.	a	20.	d	30.	b

4. **SOME BASIC PRINCIPLES OF ORGANIC CHEMISTRY
AND REACTION MECHANISM**

Answer Key

Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.
1.	a	11.	c	21.	a
2.	c	12.	d	22.	a
3.	a	13.	b	23.	b
4.	b	14.	c	24.	b
5.	c	15.	b	25.	b
6.	c	16.	d	26.	c
7.	a	17.	d	27.	a
8.	d	18.	b	28.	d
9.	b	19.	b	29.	d
10.	c	20.	a	30.	a

3. Chapter Chemical Bonding

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Tips & Tricks

- ✍ A chemical bond is expected to be formed when the energy of the aggregate formed is about 40 kJ mole^{-1} lower than the separate particles.
- ✍ Formation of a chemical bond is always an exothermic process.
- ✍ Lattice energies of bi-bivalent solids > bi-univalent solids > uni-univalent solids. For example, lattice energy of $Mg^{2+}O^{2-}$ ($3932 \text{ kJ mole}^{-1}$) > $Ca^{2+}(F^-)_2$ (258 kJ mole^{-1}) > Li^+F^- ($1034 \text{ kJ mole}^{-1}$).
- ✍ When co-ordination number increases, the coulombic forces of attraction increases and hence stability increases.
- ✍ Ionic solids have negative vapour pressure.
- ✍ As a general rule, atomic crystals are formed by the lighter elements of the middle columns of the periodic table.
- ✍ $FeCl_3$ is more covalent than $FeCl_2$ because polarising power of Fe^{3+} is more than that of Fe^{2+} . Similarly $SnCl_4$ is more covalent than $SnCl_2$.
- ✍ Boron forms the maximum number of electron deficient compounds than any other elements in the periodic table.
- ✍ Roughly each lone pair decreases the bond angle by 2.5° .
- ✍ Greater the number of the lone pairs at the two bonding atoms, greater is the repulsion between them and weaker is the bond.
- ✍ The actual number of *s*- and *p*-electrons present in the outermost shell of the element is called maximum covalency of that atom.
- ✍ The hydrogen bonds are tetrahedral in their directions and not planar.
- ✍ The hydrogen bond is stronger in *HF* and persists

even in vapour state. Such bonds account for the fact that gaseous hydrogen fluoride is largely polymerised into the molecular species $H_2F_2, H_3F_3, H_4F_4, H_5F_5$ and H_6F_6 .

- ✍ Hydrogen bonding is strongest when the bonded structure is stabilised by resonance.
- ✍ Critical temperature of water is higher than that of O_2 because H_2O molecule has dipole moment.

Ordinary Thinking

Objective Questions

Electrovalent bonding

1. Which forms a crystal of $NaCl$ [CPMT 1972; NCERT 1976; DPMT 1996]
 - (a) $NaCl$ molecules (b) Na^+ and Cl^- ions
 - (c) Na and Cl atoms (d) None of the above
2. When sodium and chlorine reacts then [NCERT 1973]
 - (a) Energy is released and ionic bond is formed
 - (b) Energy is released and a covalent bond is formed
 - (c) Energy is absorbed and ionic bond is formed
 - (d) Energy is absorbed and covalent bond is formed
3. Which one is least ionic in the following compounds [CPMT 1976; BHU 1998]
 - (a) $AgCl$ (b) KCl
 - (c) $BaCl_2$ (d) $CaCl_2$
4. The electronic configuration of four elements *L*, *P*, *Q* and *R* are given in brackets

$L(1s^2, 2s^2 2p^4)$ $Q(1s^2, 2s^2 2p^6, 3s^2 3p^5)$

$P(1s^2, 2s^2 2p^6, 3s^1)$ $R(1s^2, 2s^2 2p^6, 3s^2)$

The formulae of ionic compounds that can be formed between these elements are [NCERT 1983]

 - (a) L_2P , RL , PQ and R_2Q (b) LP , RL , PQ and RQ
 - (c) P_2L , RL , PQ and RQ_2 (d) LP , R_2L , P_2Q and RQ
5. Electrovalent compound's [MP PMT 1984]
 - (a) Melting points are low
 - (b) Boiling points are low
 - (c) Conduct current in fused state
 - (d) Insoluble in polar solvent
6. A electrovalent compound is made up of [CPMT 1978, 81; MNR 1979]

- (a) Electrically charged molecules
(b) Neutral molecules
(c) Neutral atoms
(d) Electrically charged atoms or group of atoms
7. Electrovalent bond formation depends on
(a) Ionization energy (b) Electron affinity
(c) Lattice energy (d) All the three above
8. In the following which substance will have highest boiling point [NCERT 1973; MP PMT 1990]
(a) He (b) CsF
(c) NH_3 (d) $CHCl_3$
9. An atom of sodium loses one electron and chlorine atom accepts one electron. This results the formation of sodium chloride molecule. This type of molecule will be [MP PMT 1987]
(a) Coordinate (b) Covalent
(c) Electrovalent (d) Metallic bond
10. Formula of a metallic oxide is MO . The formula of its phosphate will be [CPMT 1986, 93]
(a) $M_2(PO_4)_2$ (b) $M(PO_4)$
(c) M_2PO_4 (d) $M_3(PO_4)_2$
11. From the following which group of elements easily forms cation
(a) F, Cl, Br (b) Li, Na, K
(c) O, S, Se (d) N, P, As
12. Which type of compounds show high melting and boiling points [CPMT 1996]
(a) Electrovalent compounds
(b) Covalent compounds
(c) Coordinate compounds
(d) All the three types of compounds have equal melting and boiling points
13. Lattice energy of an ionic compound depends upon [AIEEE 2005]
(a) Charge on the ion only
(b) Size of the ion only
(c) Packing of ions only
(d) Charge on the ion and size of the ion
14. In the given bonds which one is most ionic [EAMCET 1980]
(a) $Cs - Cl$ (b) $Al - Cl$
(c) $C - Cl$ (d) $H - Cl$
15. Element X is strongly electropositive and Y is strongly electronegative. Both elements are univalent, the compounds formed from their combination will be [IIT 1980]
(a) X^+Y^- (b) X^-Y^+
(c) $X - Y$ (d) $X \rightarrow Y$
16. In the formation of $NaCl$ from Na and Cl [CPMT 1985]
(a) Sodium and chlorine both give electrons
(b) Sodium and chlorine both accept electrons
(c) Sodium loses electron and chlorine accepts electron
(d) Sodium accepts electron and chlorine loses electron
17. Which of the following is an electrovalent linkage [CPMT 1974; DPMT 1984, 91; AFMC 1988]
(a) CH_4 (b) $MgCl_2$
(c) $SiCl_4$ (d) BF_3
18. Electrovalent compounds do not have [CPMT 1991]
(a) High M.P. and Low B.P. (b) High dielectric constant
(c) High M.P. and High B.P. (d) High polarity
19. Many ionic crystals dissolve in water because [NCERT 1982]
(a) Water is an amphoteric solvent
(b) Water is a high boiling liquid
(c) The process is accompanied by a positive heat of solution
(d) Water decreases the interionic attraction in the crystal lattice due to solvation
20. The electronic structure of four elements A, B, C, D are
(A) $1s^2$ (B) $1s^2, 2s^2 2p^2$
(C) $1s^2, 2s^2 2p^5$ (D) $1s^2, 2s^2 2p^6$
The tendency to form electrovalent bond is largest in [MNR 1987, 95]
(a) A (b) B
(c) C (d) D
21. Chloride of metal is MCl_2 . The formula of its phosphate will be [CPMT 1979]
(a) M_2PO_4 (b) $M_3(PO_4)_2$
(c) $M_2(PO_4)_3$ (d) MPO_4
22. The phosphate of a metal has the formula MPO_4 . The formula of its nitrate will be [CPMT 1971; MP PMT 1996]
(a) MNO_3 (b) $M_2(NO_3)_2$

- (c) $M(NO_3)_2$ (d) $M(NO_3)_3$
23. In the transition of Zn atoms to Zn^{++} ions there is a decrease in the [CPMT 1972]
 (a) Number of valency electrons
 (b) Atomic weight
 (c) Atomic number
 (d) Equivalent weight
24. Phosphate of a metal M has the formula $M_3(PO_4)_2$. The formula for its sulphate would be [CPMT 1973; MP PMT 1996]
 (a) MSO_4 (b) $M(SO_4)_2$
 (c) $M_2(SO_4)_3$ (d) $M_3(SO_4)_2$
25. The molecular formula of chloride of a metal M is MCl_3 . The formula of its carbonate would be [CPMT 1987]
 (a) MCO_3 (b) $M_2(CO_3)_3$
 (c) M_2CO_3 (d) $M(CO_3)_2$
26. Sodium chloride easily dissolves in water. This is because [NCERT 1972; BHU 1973]
 (a) It is a covalent compound
 (b) Salt reacts with water
 (c) It is a white substance
 (d) Its ions are easily solvated
27. When $NaCl$ is dissolved in water the sodium ion becomes [NCERT 1974; CPMT 1989; MP PMT 1999]
 (a) Oxidized (b) Reduced
 (c) Hydrolysed (d) Hydrated
28. Solid $NaCl$ is a bad conductor of electricity since [AFMC 1980]
 (a) In solid $NaCl$ there are no ions
 (b) Solid $NaCl$ is covalent
 (c) In solid $NaCl$ there is no motion of ions
 (d) In solid $NaCl$ there are no electrons
29. Favourable conditions for electrovalency are
 (a) Low charge on ions, large cation, small anion
 (b) High charge on ions, small cation, large anion
 (c) High charge on ions, large cation, small anion
 (d) Low charge on ions, small cation, large anion
30. The sulphate of a metal has the formula $M_2(SO_4)_3$. The formula for its phosphate will be [DPMT 1982; CPMT 1972; MP PMT 1995]
 (a) $M(HPO_4)_2$ (b) $M_3(PO_4)_2$
 (c) $M_2(PO_4)_3$ (d) MPO_4
31. Ionic bonds are usually formed by combination of elements with [CBSE PMT 1993; MP PMT 1994]
 (a) High ionisation potential and low electron affinity
 (b) Low ionisation potential and high electron affinity
 (c) High ionisation potential and high electron affinity
 (d) Low ionisation potential and low electron affinity
32. Molten sodium chloride conducts electricity due to the presence of [IIT 1981]
 (a) Free electrons
 (b) Free ions
 (c) Free molecules
 (d) Atoms of sodium and chlorine
33. The phosphate of a metal has the formula $MHPO_4$. The formula of its chloride would be [NCERT 1974; CPMT 1977]
 (a) MCl (b) MCl_2
 (c) MCl_3 (d) M_2Cl_3
34. A number of ionic compounds e.g. $AgCl$, CaF_2 , $BaSO_4$ are insoluble in water. This is because [NCERT 1984]
 (a) Ionic compounds do not dissolve in water
 (b) Water has a high dielectric constant
 (c) Water is not a good ionizing solvent
 (d) These molecules have exceptionally high alternative forces in the lattice
35. What is the nature of chemical bonding between Cs and F [MP PMT 1987; CPMT 1976]
 (a) Covalent (b) Ionic
 (c) Coordinate (d) Metallic
36. Which one of the following compound is ionic [MNR 1985]
 (a) KCl (b) CH_4
 (c) Diamond (d) H_2
37. Which of the following compound has electrovalent linkage [CPMT 1983, 84, 93]
 (a) CH_3Cl (b) $NaCl$
 (c) CH_4 (d) Cl_2
38. An ionic compound is generally a [MADT Bihar 1981]

- (a) Good electrolyte (b) Weak electrolyte
(c) Non-electrolyte (d) Neutral
39. What metals combine with non-metals, the metal atom tends to [AMU 1982]
(a) Lose electrons
(b) Gain electrons
(c) Remain electrically neutral
(d) None of these
40. Chemical formula for calcium pyrophosphate is $Ca_2P_2O_7$. The formula for ferric pyrophosphate will be [NCERT 1977]
(a) $Fe_3(P_2O_7)_3$ (b) $Fe_4P_4O_{14}$
(c) $Fe_4(P_2O_7)_3$ (d) Fe_3PO_4
41. Among the bonds formed by a chlorine atom with atoms of hydrogen, chlorine, sodium and carbon, the strongest bond is formed between [EAMCET 1988; MP PMT 1993]
(a) $H - Cl$ (b) $Cl - Cl$
(c) $Na - Cl$ (d) $C - Cl$
42. Which of the following is least soluble [CPMT 1989]
(a) BeF_2 (b) SrF_2
(c) CaF_2 (d) MgF_2
43. Which of the following halides has maximum melting point
(a) $NaCl$ (b) $NaBr$
(c) NaI (d) NaF
44. The high melting point and insolubility in organic solvents of sulphanilic acid are due to its structure. [IIT 1994]
(a) Simple ionic (b) Bipolar ionic
(c) Cubic (d) Hexagonal
45. Out of the following, which compound will have electrovalent bonding
(a) Ammonia (b) Water
(c) Calcium chloride (d) Chloromethane
46. The force which holds atoms together in an electrovalent bond is
(a) Vander Waal's force
(b) Dipole attraction force
(c) Electrostatic force of attraction
(d) All the above
47. The main reaction during electrovalent bond formation is
(a) Redox reaction (b) Substitution reaction
(c) Addition reaction (d) Elimination reaction
48. Electrovalent compounds are [CPMT 1996]
(a) Good conductor of electricity
(b) Polar in nature
(c) Low M.P. and low B.P.
(d) Easily available
49. Ionic compounds do not have [RPMT 1997]
(a) Hard and brittle nature
(b) High melting and boiling point
(c) Directional properties
(d) Soluble in polar solvents
50. Highest melting point would be of [RPMT 1999]
(a) He (b) $CsCl$
(c) NH_3 (d) $CHCl_3$
51. What is the effect of more electronegative atom on the strength of ionic bond [AMU 1999]
(a) Decreases (b) Increases
(c) Decreases slowly (d) Remains the same
52. An element X with the electronic configuration $1s^2, 2s^2 2p^6, 3s^2$ would be expected to form the chloride with the formula [JIPMER 2000]
(a) XCl_3 (b) XCl_2
(c) XCl (d) X_2Cl
53. Two elements have electronegativity of 1.2 and 3.0. Bond formed between them would be [CPMT 1982; DCE 2000]
(a) Ionic (b) Polar covalent
(c) Co-ordinate (d) Metallic
54. Which of the following is least ionic [MP PET 2002]
(a) C_2H_5Cl (b) KCl
(c) $BaCl_2$ (d) $C_6H_5N^+H_3Cl^-$
55. Which type of bonding exists in Li_2O and CaF_2 respectively [RPET 2000]
(a) Ionic, ionic (b) Ionic, covalent
(c) Covalent, ionic (d) Coordinate, ionic
56. An atom with atomic number 20 is most likely to combine chemically with the atom whose atomic number is [BHU 2000]
(a) 11 (b) 14
(c) 16 (d) 10
57. Bond formed in crystal by anion and cation is

[CBSE PMT 2000]

- (a) Ionic (b) Metallic
(c) Covalent (d) Dipole

58. Atoms or group of atoms which are electrically charged are known [UPSEAT 2001]

- (a) Anions (b) Cations
(c) Ions (d) Atoms

59. Which one is the strongest bond [Pb. PMT 2001]

- (a) $Br - F$ (b) $F - F$
(c) $Cl - F$ (d) $Br - Cl$

60. The interionic attraction depends on interaction of [Kerala CET (Med.) 2002]

- (a) Solute-Solute (b) Solvent-Solvent
(c) The charges (d) Molecular properties

61. Which of the following compounds is ionic [UPSEAT 2002]

- (a) KI (b) CH_4
(c) Diamond (d) H_2

62. Which of the following pairs of species has same electronic configuration [UPSEAT 2002]

- (a) Zn^{2+} and Ni^{2+} (b) Co^{+3} and Ni^{4+}
(c) Co^{2+} and Ni^{2+} (d) Ti^{4+} and V^{3+}

63. The energy that opposes dissolution of a solvent is [CPMT 2002]

- (a) Hydration energy (b) Lattice energy
(c) Internal energy (d) Bond energy

64. Which of the following has highest melting point [RPET 2003]

- (a) $BeCl_2$ (b) $MgCl_2$
(c) $CaCl_2$ (d) $BaCl_2$

65. Which of the following statements is not true for ionic compounds [RPET 2003]

- (a) High melting point
(b) Least lattice energy
(c) Least solubility in organic compounds
(d) Soluble in water

66. Electrolytes are compound containing [MADT Bihar 1981]

- (a) Electrovalent bond (b) Covalent bond
(c) Coordinate bond (d) Hydrogen bond

67. Which of the following hydrides are ionic [Roorkee 1999]

- (a) CaH_2 (b) BaH_2

- (c) SrH_2 (d) BeH_2

68. Which of the following conduct electricity in the fused state

[Roorkee 2000]

- (a) $BeCl_2$ (b) $MgCl_2$
(c) $SrCl_2$ (d) $BaCl_2$

Covalent bonding

1. The valency of sulphur in sulphuric acid is [NCERT 1974]

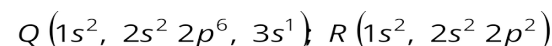
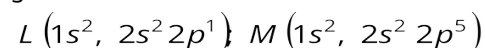
- (a) 2 (b) 4
(c) 6 (d) 8

2. The number of electrons involved in the bond formation of N_2 molecule

[IIT 1980; CPMT 1983, 84, 85; CBSE PMT 1992]

- (a) 2 (b) 4
(c) 6 (d) 10

3. The electronic configuration of four elements are given in brackets



The element that would most readily form a diatomic molecule is

[NCERT 1983]

- (a) Q (b) M
(c) R (d) L

4. In covalency [CPMT 1974, 76, 78, 81; AFMC 1982]

- (a) Electrons are transferred
(b) Electrons are equally shared
(c) The electron of one atom are shared between two atoms
(d) None of the above

5. Which compound is highest covalent

- (a) $LiCl$ (b) LiF
(c) $LiBr$ (d) LiI

6. The nature of bonding in graphite is

[DPMT 1986; CPMT 1986]

- (a) Covalent (b) Ionic
(c) Metallic (d) Coordinate

7. Which of the following substances has giant covalent structure [DPMT 1985, 86; NCERT 1975]

- (a) Iodine crystal (b) Solid CO_2
(c) Silica (d) White phosphorus

8. With which of the given pairs CO_2 resembles [BHU 2005]

- (a) $HgCl_2, C_2H_2$ (b) $HgCl_2, SnCl_4$

- (c) C_2H_2, NO_2 (d) N_2O and NO_2
9. The electron pair which forms a bond between two similar non-metallic atoms will be [IIT 1986]
 (a) Dissimilar shared between the two
 (b) By complete transfer from one atom to other
 (c) In a similar spin condition
 (d) Equally shared in between the two
10. For the formation of covalent bond, the difference in the value of electronegativities should be [EAMCET 1982]
 (a) Equal to or less than 1.7 (b) More than 1.7
 (c) 1.7 or more (d) None of these
11. Which type of bond is formed between similar atoms
 (a) Ionic (b) Covalent
 (c) Coordinate (d) Metallic
12. Covalent compounds are generally in water [CPMT 1987]
 (a) Soluble (b) Insoluble
 (c) Dissociated (d) Hydrolysed
13. Which one is the electron deficient compound [AIIMS 1982]
 (a) ICl (b) NH_3
 (c) BCl_3 (d) PCl_3
14. Which among the following elements has the tendency to form covalent compounds
 (a) Ba (b) Be
 (c) Mg (d) Ca
15. Silicon has 4 electrons in the outermost orbit. In forming the bonds [EAMCET 1981]
 (a) It gains electrons (b) It loses electrons
 (c) It shares electrons (d) None of these
16. Which of the following occurs when two hydrogen atoms bond with each others
 (a) Potential energy is lowered
 (b) Kinetic energy is lowered
 (c) Electronic motion ceases
 (d) Energy is absorbed
17. A bond with maximum covalent character between non-metallic elements is formed [NCERT 1982]
 (a) Between identical atoms
 (b) Between chemically similar atoms
 (c) Between atoms of widely different electronegativities
 (d) Between atoms of the same size
18. Amongst the following covalent bonding is found in [CPMT 1973]
 (a) Sodium chloride (b) Magnesium chloride
- (c) Water (d) Brass
19. Indicate the nature of bonding in diamond [EAMCET 1980; BHU 1996; KCET 2000]
 (a) Covalent (b) Ionic
 (c) Coordinate (d) Hydrogen
20. Octet rule is not valid for the molecule [IIT 1979; MP PMT 1995]
 (a) CO_2 (b) H_2O
 (c) CO (d) O_2
21. Which of the following compounds are covalent [IIT 1980; MLNR 1982]
 (a) H_2 (b) CaO
 (c) KCl (d) Na_2S
22. Indicate the nature of bonding in CCl_4 and CaH_2 [NCERT 1973]
 (a) Covalent in CCl_4 and electrovalent in CaH_2
 (b) Electrovalent in both CCl_4 and CaH_2
 (c) Covalent in both CCl_4 and CaH_2
 (d) Electrovalent in CCl_4 and covalent in CaH_2
23. If the atomic number of element X is 7, the best electron dot symbol for the element is [NCERT 1973; CPMT 2003]
 (a) $\cdot X \cdot$ (b) $\cdot X \cdot$
 (c) $\cdot \overset{\cdot}{X} \cdot$ (d) $:\overset{\cdot\cdot}{X}:$
24. Which is the most covalent [AFMC 1982]
 (a) $C - O$ (b) $C - Br$
 (c) $C - S$ (d) $C - F$
25. The covalent compound HCl has the ionic character as [EAMCET 1980]
 (a) The electronegativity of hydrogen is greater than that of chlorine
 (b) The electronegativity of hydrogen is equal to that of chlorine
 (c) The electronegativity of chlorine is greater than that of hydrogen
 (d) Hydrogen and chlorine are gases
26. The correct sequence of increasing covalent character is represented by [CBSE PMT 2005]
 (a) $LiCl < NaCl < BeCl_2$ (b) $BeCl_2 < NaCl < LiCl$

(c) $\text{NaCl} < \text{LiCl} < \text{BeCl}_2$ (d) $\text{BeCl}_2 < \text{LiCl} < \text{NaCl}$

27. Bond energy of covalent $\text{O} - \text{H}$ bond in water is

[EAMCET 1982]

- (a) Greater than bond energy of $\text{H} - \text{bond}$
- (b) Equal to bond energy of $\text{H} - \text{bond}$
- (c) Less than bond energy of $\text{H} - \text{bond}$
- (d) None of these

28. Solid CH_4 is

[DPMT 1983]

- (a) Molecular solid
- (b) Ionic solid
- (c) Pseudo solid
- (d) Does not exist

29. A covalent bond is likely to be formed between two elements which

[MP PMT 1987]

- (a) Have similar electronegativities
- (b) Have low ionization energies
- (c) Have low melting points
- (d) Form ions with a small charge

30. The bond between two identical non-metal atoms has a pair of electrons

[CPMT 1986]

- (a) Unequally shared between the two
- (b) Transferred fully from one atom to another
- (c) With identical spins
- (d) Equally shared between them

31. The valency of phosphorus in H_3PO_4 is

[DPMT 1984]

- (a) 2
- (b) 5
- (c) 4
- (d) 1

32. Which of the following substances has covalent bonding

[AMU 1985]

- (a) Germanium
- (b) Sodium chloride
- (c) Solid neon
- (d) Copper

33. The covalency of nitrogen in HNO_3 is

[CPMT 1987]

- (a) 0
- (b) 3
- (c) 4
- (d) 5

34. Hydrogen chloride molecule contains a

[CPMT 1984]

- (a) Covalent bond
- (b) Double bond
- (c) Coordinate bond
- (d) Electrovalent bond

35. As compared to covalent compounds, electrovalent compounds generally have

[CPMT 1990, 94; MP PMT 1997]

- (a) Low melting points and low boiling points
- (b) Low melting points and high boiling points

(c) High melting points and low boiling points

(d) High melting points and high boiling points

36. The interatomic distances in H_2 and Cl_2 molecules are 74 and 198 pm respectively. The bond length of HCl is

[MP PET 1993]

- (a) 272 pm
- (b) 136 pm
- (c) 124 pm
- (d) 248 pm

37. On analysis, a certain compound was found to contain iodine and oxygen in the ratio of 254 gm of iodine and 80 gm of oxygen. The atomic mass of iodine is 127 and that of oxygen is 16. Which of the following is the formula of the compound

[CPMT 1981]

- (a) IO
- (b) I_2O
- (c) I_5O_2
- (d) I_2O_5

38. Ionic and covalent bonds are present in

[CBSE PMT 1990; MNR 1990; KCET 2000; UPSEAT 2001]

- (a) CCl_4
- (b) CaCl_2
- (c) NH_4Cl
- (d) H_2O

39. Highest covalent character is found in

[EAMCET 1992]

- (a) CaF_2
- (b) CaCl_2
- (c) CaBr_2
- (d) CaI_2

40. Among the following which property is commonly exhibited by a covalent compound

[MP PET 1994]

- (a) High solubility in water
- (b) High electrical conductance
- (c) Low boiling point
- (d) High melting point

41. Atoms in the water molecule are linked by

[MP PAT 1996]

- (a) Electrovalent bond
- (b) Covalent bond
- (c) Coordinate covalent bond
- (d) Odd electron bond

42. Which is the correct electron dot structure of N_2O molecule

[MP PET 1996]

- (a) $:\text{N} = \text{N} = \ddot{\text{O}}:$
- (b) $:\text{N} \equiv \text{N}^+ - \ddot{\text{O}}:^-$
- (c) $\ddot{\text{N}} = \ddot{\text{N}} = \ddot{\text{O}}:$
- (d) $:\text{N} = \text{N} = \ddot{\text{O}}:$

43. A covalent bond between two atoms is formed by which of the following [MP PMT 1996]
 (a) Electron nuclear attraction
 (b) Electron sharing
 (c) Electron transfer
 (d) Electrostatic attraction
44. The electronic configuration of a metal M is $1s^2, 2s^2 2p^6, 3s^1$. The formula of its oxides will be [MP PET/PMT 1998]
 (a) MO (b) M_2O
 (c) M_2O_3 (d) MO_2
45. Which of the following statements regarding covalent bond is not true [MP PET/PMT 1998]
 (a) The electrons are shared between atoms
 (b) The bond is non-directional
 (c) The strength of the bond depends upon the extent of overlapping
 (d) The bond formed may or may not be polar
46. If the electronic configuration of $M = 2, 8, 3$ and that of $A = 2, 8, 7$, the formula of the compound is [Bihar MEE 1996]
 (a) M_2A_3 (b) MA_2
 (c) M_2A (d) MA_3
 (e) M_3A
47. The table shown below gives the bond dissociation energies (E_{diss}) for single covalent bonds of carbon (C) atoms with element A, B, C and D . Which element has the smallest atoms [CBSE PMT 1994]
- | Bond | $E_{diss} (kJ\ mol^{-1})$ |
|---------|---------------------------|
| $C - A$ | 240 |
| $C - B$ | 328 |
| $C - C$ | 276 |
| $C - D$ | 485 |
- (a) A (b) B
 (c) C (d) D
48. If a molecule X_2 has a triple bond, then X will have the electronic configuration [CET Pune 1998]
 (a) $1s^2 2s^2 2p^5$ (b) $1s^2 2s^2 2p^3$
 (c) $1s^2 2s^1$ (d) $1s^2 2s^2 2p^1$
49. Which of the following compounds does not follow the octet rule for electron distribution [CET Pune 1998]
 (a) PCl_5 (b) PCl_3
 (c) H_2O (d) PH_3
50. The valency of $A = 3$ and $B = 2$, then the compound is [Bihar MEE 1997]
 (a) A_2B_3 (b) A_3B_2
 (c) A_3B_3 (d) A_2B_2
 (e) None of these
51. The number of electrons shared by each outermost shell of N_2 is [AFMC 1998]
 (a) 2 (b) 3
 (c) 4 (d) 5
52. Which of the following substances when dissolved in water will give a solution that does not conduct electricity [JIPMER 1999]
 (a) Hydrogen chloride (b) Potassium hydroxide
 (c) Sodium acetate (d) Urea
53. Which of the following atoms has minimum covalent radius [DPMT 2000]
 (a) B (b) C
 (c) N (d) Si
54. Boron form covalent compound due to [Pb. PMT 2000]
 (a) Small size (b) Higher ionization energy
 (c) Lower ionization energy (d) Both (a) and (b)
55. Two elements X and Y have following electron configurations
 $X = 1s^2, 2s^2 2p^6, 3s^2 3p^6, 4s^2$
 and $Y = 1s^2, 2s^2 2p^6, 3s^2 3p^6$
 The compound formed by combination of X and Y is [DPMT 2001]
 (a) XY_5 (b) X_2Y_5
 (c) X_5Y_3 (d) XY_2
56. Covalent compounds have low melting point because [KCET 2002]
 (a) Covalent bond is less exothermic
 (b) Covalent molecules have definite shape
 (c) Covalent bond is weaker than ionic bond
 (d) Covalent molecules are held by weak Vander Waal's force of attraction
57. p and n -type of semiconductors are formed due to [UPSEAT 2002]
 (a) Covalent bonds (b) Metallic bonds
 (c) Ionic bonds (d) Co-ordinate bond
58. Which of the following is Lewis acid [RPET 2003]

- (a) BF_3 (b) NH_3
(c) PH_3 (d) SO_2
59. Among the species : CO_2 , CH_3COO^- , CO , CO_3^{2-} , $HCHO$ which has the weakest carbon-oxygen bond
[Kerala PMT 2004]
(a) CO_2 (b) CH_3COO^-
(c) CO (d) CO_3^{2-}
(e) $HCHO$
60. Valency of sulphur in $Na_2S_2O_3$ is [DPMT 1984]
(a) Two (b) Three
(c) Four (d) Six
61. The acid having $O-O$ bond is [IIT JEE Screening 2004]
(a) $H_2S_2O_3$ (b) $H_2S_2O_6$
(c) $H_2S_2O_8$ (d) $H_2S_4O_6$
62. The following salt shows maximum covalent character [UPSEAT 2004]
(a) $AlCl_3$ (b) $MgCl_2$
(c) $CsCl$ (d) $LaCl_3$
63. Which type of bond is present in H_2S molecule [MHCET 2003; Pb CET 2001]
(a) Ionic bond (b) Covalent bond
(c) Co-ordinate (d) All of three
64. H_2S is more acidic than H_2O , due to [BVP 2004]
(a) O is more electronegative than S
(b) $O-H$ bond is stronger than $S-H$ bond
(c) $O-H$ bond is weaker than $S-H$ bond
(d) None of these
65. Which of the following has covalent bond [AFMC 1988; DCE 2004]
(a) Na_2S (b) $AlCl_3$
(c) NaH (d) $MgCl_2$
66. The following element forms a molecule with eight its own weight atoms [MHCET 2004]
(a) Si (b) S
(c) Cl (d) P
67. In H_2O_2 , the two oxygen atoms have
(a) Electrovalent bond (b) Covalent bond
(c) Coordinate bond (d) No bond
68. Carbon has a valency of 2 in CO and 4 in CO_2 and CH_4 . Its valency in acetylene (C_2H_2) is [NCERT 1971]
(a) 1 (b) 2
(c) 3 (d) 4
69. Number of electrons in the valence orbit of nitrogen in an ammonia molecule are [MH CET 2004]
(a) 8 (b) 5
(c) 6 (d) 7
70. Hydrogen atoms are held together to form hydrogen molecules by [AMU 1982]
(a) Hydrogen bond (b) Ionic bond
(c) Covalent bond (d) Dative bond
71. Strongest bond is [AFMC 1987]
(a) $C-C$ (b) $C-H$
(c) $C-N$ (d) $C-O$
72. The major binding force of diamond, silicon and quartz is [Kerala CET (Med.) 2002]
(a) Electrostatic force (b) Electrical attraction
(c) Co-valent bond force (d) Non-covalent bond force
73. Multiple covalent bonds exist in a molecule of [NCERT 1973]
(a) H_2 (b) F_2
(c) C_2H_4 (d) N_2
74. Which of the following does not obey the octet rule [EAMCET 1993]
(a) CO (b) NH_3
(c) H_2O (d) PCl_5
75. Which of the following statements is correct for covalent bond [BHU 1997]
(a) Electrons are shared between two atoms
(b) It may be polar or non-polar
(c) Direction is non-polar
(d) Valency electrons are attracted
76. Among CaH_2 , NH_3 , NaH and B_2H_6 , which are covalent hydride [Orissa JEE 2005]
(a) NH_3 and B_2H_6 (b) NaH and CaH_2
(c) NaH and NH_3 (d) CaH_2 and B_2H_6

Co-ordinate or Dative bonding

1. Which species has the maximum number of lone pair of electrons on the central atom? [IIT 2005]
(a) $[ClO_3]^-$ (b) XeF_4
(c) SF_4 (d) $[I_3]^-$
2. A simple example of a coordinate covalent bond is exhibited by [NCERT 1984]

- (a) C_2H_2 (b) H_2SO_4
(c) NH_3 (d) HCl
3. The bond that exists between NH_3 and BF_3 is called
[AFMC 1982; MP PMT 1985; MNR 1994; KCET 2000; MP PET 2001; UPSEAT 2001]
(a) Electrovalent (b) Covalent
(c) Coordinate (d) Hydrogen
4. Which of the following does not have a coordinate bond
[MADT Bihar 1984]
(a) SO_2 (b) HNO_3
(c) H_2SO_3 (d) HNO_2
5. Coordinate covalent compounds are formed by
[CPMT 1990, 94]
(a) Transfer of electrons (b) Sharing of electrons
(c) Donation of electrons (d) None of these process
6. In the coordinate valency [CPMT 1989]
(a) Electrons are equally shared by the atoms
(b) Electrons of one atom are shared with two atoms
(c) Hydrogen bond is formed
(d) None of the above
7. Which of the following contains a coordinate covalent bond
[MNR 1990; IIT 1986]
(a) N_2O_5 (b) $BaCl_2$
(c) HCl (d) H_2O
8. A coordinate bond is formed when an atom in a molecule has
[CBSE PMT 1992]
(a) Electric charge on it
(b) All its valency electrons shared
(c) A single unshared electron
(d) One or more unshared electron pair
9. Which has a coordinate bond [RPMT 1997]
(a) SO_3^{2-} (b) CH_4
(c) CO_2 (d) NH_3
10. The compound containing co-ordinate bond is
[AFMC 1999; Pb. CET 2002]
(a) O_3 (b) SO_3
(c) H_2SO_4 (d) All of these
11. The number of dative bonds in sulphuric acid molecules is
[MP PET 2002]
(a) 0 (b) 1

- (c) 2 (d) 4
12. Which of the following compounds has coordinate (dative) bond [RPET 2003]
(a) CH_3NC (b) CH_3OH
(c) CH_3Cl (d) NH_3
13. The structure of orthophosphoric acid is [KCET 2003]
- $$\begin{array}{c} O \\ \uparrow \\ H-O-P-O-H \\ | \\ O \\ | \\ H \end{array}$$

(a)

$$\begin{array}{c} H \\ | \\ O \leftarrow P-O-H \\ | \\ O \\ | \\ H \end{array}$$

(b)
- $$\begin{array}{c} H \\ | \\ O \leftarrow P-O-H \\ | \\ H \end{array}$$

(c)

$$\begin{array}{c} H \\ | \\ O \leftarrow P-O-H \\ | \\ H \end{array}$$

(d)
- $$\begin{array}{c} O \\ \uparrow \\ H-O-P=O \end{array}$$
14. What is the nature of the bond between B and O in $(C_2H_5)_2OBH_3$ [Orissa JEE 2003]
(a) Covalent (b) Co-ordinate covalent
(c) Ionic bond (d) Banana shaped bond
15. Sulphuric acid provides a example of [Kerala CET (Med.) 2002]
(a) Co-ordinate bonds
(b) Non-covalent compound
(c) Covalent and co-ordinate bond
(d) Non-covalent ion

Dipole moment

1. Which molecules has zero dipole moment
[AIIMS 1980, 82, 91; Roorkee 2000; MH CET 2001]
(a) H_2O (b) CO_2
(c) HF (d) HBr
2. In the following which one have zero dipole moment
[DPMT 1985]
(a) BF_3 (b) CCl_4
(c) $BeCl_2$ (d) All of these
3. Which molecule has the largest dipole moment
[CPMT 1991]
(a) HCl (b) HI
(c) HBr (d) HF
4. The unequal sharing of bonded pair of electrons between two atoms in a molecule causes [EAMCET 1986]

- (a) Dipole
(b) Radical formation
(c) Covalent bond
(d) Decomposition of molecule
5. Which of the following will show least dipole character
[NCERT 1975; Kurukshetra CEE 1998]
(a) Water (b) Ethanol
(c) Ethane (d) Ether
6. Which of the following molecules will show dipole moment
[NCERT 1972, 74; DPMT 1985]
(a) Methane (b) Carbon tetrachloride
(c) Chloroform (d) Carbon dioxide
7. Which of the following compounds possesses the dipole moment [NCERT 1978; EAMCET 1983; MP PMT 1995]
(a) Water (b) Boron trifluoride
(c) Benzene (d) Carbon tetrachloride
8. Which bond angle θ would result in the maximum dipole moment for the triatomic molecule YXY [AIIMS 1980]
(a) $\theta = 90^\circ$ (b) $\theta = 120^\circ$
(c) $\theta = 150^\circ$ (d) $\theta = 180^\circ$
9. Which of the following would have a permanent dipole moment [CBSE PMT 2005]
(a) BF_3 (b) SiF_4
(c) SF_4 (d) XeF_4
10. Carbon tetrachloride has no net dipole moment because of
[IIT 1982, 83; MP PMT 1985, 91; EAMCET 1988; AMU 1999]
(a) Its planar structure
(b) Its regular tetrahedral structure
(c) Similar sizes of carbon and chlorine atoms
(d) Similar electron affinities of carbon and chlorine
11. The molecule which has the largest dipole moment amongst the following [MNR 1983]
(a) CH_4 (b) $CHCl_3$
(c) CCl_4 (d) CHI_3
12. Positive dipole moment is present in [MNR 1986; MP PET 2000]
(a) CCl_4 (b) C_6H_6
(c) BF_3 (d) HF
13. The polarity of a covalent bond between two atoms depends upon [AMU 1982]
(a) Atomic size (b) Electronegativity
(c) Ionic size (d) None of the above
14. Pick out the molecule which has zero dipole moment [CPMT 1989; EAMCET 1993; MP PMT 1999]
(a) NH_3 (b) H_2O
(c) BCl_3 (d) SO_2
15. Zero dipole moment is present in [DPMT 1986; IIT 1987]
(a) NH_3 (b) H_2O
(c) *cis* 1, 2-dichloroethene (d) *trans* 1, 2-dichloroethene
16. Which of the following is the most polar [AFMC 1988]
(a) CCl_4 (b) $CHCl_3$
(c) CH_3OH (d) CH_3Cl
17. Which one has minimum (nearly zero) dipole moment [IIT Screening 1994; CBSE PMT 1996]
(a) Butene-1 (b) *cis* butene-2
(c) *trans* butene-2 (d) 2-methyl-1-propene
18. Which one of the following is having zero dipole moment [RPMT 1997; EAMCET 1988; MNR 1991]
(a) CCl_4 (b) CH_3Cl
(c) CH_3F (d) $CHCl_3$
19. Which of the following molecules does not possess a permanent dipole moment [CBSE PMT 1994]
(a) H_2S (b) SO_2
(c) CS_2 (d) SO_3
20. Which of the following has zero dipole moment [CPMT 1997; AFMC 1998; CBSE PMT 2001]
(a) CH_2Cl_2 (b) CH_4
(c) NH_3 (d) PH_3
21. Fluorine is more electronegative than either boron or phosphorus. What conclusion can be drawn from the fact that BF_3 has no dipole moment but PF_3 does [Pb. PMT 1998]
(a) BF_3 is not spherically symmetrical but PF_3 is
(b) BF_3 molecule must be linear
(c) The atomic radius of *P* is larger than the atomic radius of *B*
(d) The BF_3 molecule must be planar triangular
22. Which molecule does not show zero dipole moment [RPET 1997, 99]
(a) BF_3 (b) NH_3
(c) CCl_4 (d) CH_4

23. The dipole moment of HBr is $1.6 \times 10^{-30} \text{ cm}$ and interatomic spacing is 1\AA . The % ionic character of HBr is
[MP PMT 2000]
(a) 7 (b) 10
(c) 15 (d) 27
24. Non-polar solvent is [RPET 2000]
(a) Dimethyl sulphoxide (b) Carbon tetrachloride
(c) Ammonia (d) Ethyl alcohol
25. Which shows the least dipole moment [UPSEAT 2001; DPMT 1982]
(a) CCl_4 (b) $CHCl_3$
(c) CH_3CH_2OH (d) CH_3COCH_3
26. Which molecule has zero dipole moment [UPSEAT 2001]
(a) H_2O (b) AgI
(c) $PbSO_4$ (d) HBr
27. The dipole moment is zero for the molecule [IIT 1989; MP PMT 2002]
(a) Ammonia (b) Boron trifluoride
(c) Sulphur dioxide (d) Water
28. N_2 is less reactive than CN^- due to [UPSEAT 2003]
(a) Presence of more electrons in orbitals
(b) Absence of dipole moment
(c) Difference in spin quantum no
(d) None of these
29. In a polar molecule, the ionic charge is 4.8×10^{-10} e.s.u. If the inter ionic distance is one \AA unit, then the dipole moment is [MH CET 2003]
(a) 41.8 debye (b) 4.18 debye
(c) 4.8 debye (d) 0.48 debye
30. Which of the following is a polar compound [Pb. CET 2000]
(a) HCl (b) H_2Se
(c) CH_4 (d) HI
31. Which of the following has no dipole moment [DCE 2002]
(a) CO_2 (b) SO_3
(c) O_3 (d) H_2O
32. Which of the following is non-polar [DCE 2002]
(a) PCl_5 (b) PCl_3
(c) SF_6 (d) IF_7
33. Identify the non-polar molecule in the set of compounds given : HCl , HF , H_2 , HBr [UPSEAT 2004]
(a) H_2 (b) HCl
(c) HF , HBr (d) HBr
34. Dipole moment is shown by [IIT 1986]
(a) 1, 4-dichlorobenzene
(b) *cis* 1, 2-dichloroethene
(c) *trans* 1, 2-dichloroethene
(d) *trans* 1, 2-dichloro-2-pentene
35. If HCl molecule is completely polarized, so expected value of dipole moment is 6.12D (deby), but experimental value of dipole moment is 1.03D. Calculate the percentage ionic character [Kerala CET 2005]
(a) 17 (b) 83
(c) 50 (d) Zero
(e) 90

Polarisation and Fajan's rule

1. BF_3 and NF_3 both molecules are covalent, but BF_3 is non-polar and NF_3 is polar. Its reason is [CPMT 1989; NCERT 1980]
(a) In uncombined state boron is metal and nitrogen is gas
(b) $B-F$ bond has no dipole moment whereas $N-F$ bond has dipole moment
(c) The size of boron atom is smaller than nitrogen
(d) BF_3 is planar whereas NF_3 is pyramidal
2. Which one is polar molecule among the following
(a) CO_2 (b) CCl_4
(c) H_2O (d) CH_4
3. If the electron pair forming a bond between two atoms A and B is not in the centre, then the bond is [AIIMS 1984]
(a) Single bond (b) Polar bond
(c) Non-polar bond (d) π bond
4. Which of the following liquids is not deflected by a non-uniform electrostatic field [NCERT 1978]
(a) Water (b) Chloroform
(c) Nitrobenzene (d) Hexane

5. Which of the following is non-polar [EAMCET 1983]
 (a) H_2S (b) $NaCl$
 (c) Cl_2 (d) H_2SO_4
6. Polarization is the distortion of the shape of an anion by an adjacently placed cation. Which of the following statements is correct [NCERT 1982]
 (a) Maximum polarization is brought about by a cation of high charge
 (b) Minimum polarization is brought about by a cation of low radius
 (c) A large cation is likely to bring about a large degree of polarization
 (d) A small anion is likely to undergo a large degree of polarization
7. The bonds between P atoms and Cl atoms in PCl_5 are likely to be [MP PMT 1987]
 (a) Ionic with no covalent character
 (b) Covalent with some ionic character
 (c) Covalent with no ionic character
 (d) Ionic with some metallic character
8. Two electrons of one atom A and two electrons of another atom B are utilized to form a compound AB . This is an example of [MNR 1981]
 (a) Polar covalent bond (b) Non-polar covalent bond
 (c) Polar bond (d) Dative bond
9. In which of the following molecule is the covalent bond most polar [AMU 1985; MP PET 2001]
 (a) HI (b) HBr
 (c) HCl (d) H_2
10. Amongst ClF_3 , BF_3 and NH_3 molecules the one with non-planar geometry is [MP PMT 1999]
 (a) ClF_3 (b) NH_3
 (c) BF_3 (d) None of these
11. Which of the following possesses highest melting point [CPMT 1999]
 (a) Chlorobenzene (b) o -dichlorobenzene
 (c) m -dichlorobenzene (d) p -dichlorobenzene
12. The polar molecule among the following is [Orissa JEE 1997]
 (a) CCl_4 (b) CO_2
 (c) CH_2Cl_2 (d) $CH_2 = CH_2$
13. Which of the following have both polar and non-polar bonds [AIIMS 1997]
 (a) C_2H_6 (b) NH_4Cl
 (c) HCl (d) $AlCl_3$
14. Which of the following has a high polarising power [CET Pune 1998]
 (a) Mg^{2+} (b) Al^{3+}
 (c) Na^+ (d) Ca^{2+}
15. Maximum covalent character is associated with the compound [RPMT 1999]
 (a) NaI (b) MgI_2
 (c) $AlCl_3$ (d) AlI_3
16. Polarisability of halide ions increases in the order [DCE 1999]
 (a) F^- , I^- , Br^- , Cl^- (b) Cl^- , Br^- , I^- , F^-
 (c) I^- , Br^- , Cl^- , F^- (d) F^- , Cl^- , Br^- , I^-
17. According to Fajan's rule, covalent bond is favoured by [AIIMS 1999]
 (a) Large cation and small anion
 (b) Large cation and large anion
 (c) Small cation and large anion
 (d) Small cation and small anion
18. Which of the following statements is correct [AMU 1999]
 (a) SF_4 is polar and non-reactive
 (b) SF_6 is non-polar and very reactive
 (c) SF_6 is a strong fluorinating agent
 (d) SF_4 is prepared by fluorinating SCl_2 with NaF
19. Choose the correct statement [RPMT 2000]
 (a) Amino polarisation is more pronounced by highly charged cation
 (b) Small cation has minimum capacity to polarise an anion.
 (c) Small anion has maximum polarizability
 (d) None of these
20. The ICl molecule is [DPMT 2001]
 (a) Purely electrovalent
 (b) Purely covalent
 (c) Polar with negative end on iodine
 (d) Polar with negative end on chlorine
21. Which of the following is a polar compound [AIIMS 2001]
 (a) HF (b) HCl
 (c) HNO_3 (d) H_2SO_4
22. Which of the following has zero dipole moment [MP PMT 2002]

- (a) ClF (b) PCl_3
(c) SiF_4 (d) $CFCl_3$
23. Which of the following compounds has least dipole moment
[RPET 2003]
(a) PH_3 (b) $CHCl_3$
(c) NH_3 (d) BF_3
24. Pauling's electronegativity values for elements are useful in predicting
[UPSEAT 2004]
(a) Polarity of bonds in molecules
(b) Position of elements in electrochemical series
(c) Co-ordination number
(d) Dipole moment of various molecules
25. Amongst $LiCl$, $RbCl$, $BeCl_2$ and $MgCl_2$ the compounds with the greatest and the least ionic character, respectively, are
[UPSEAT 2002]
(a) $LiCl$ and $RbCl$ (b) $RbCl$ and $BeCl_2$
(c) $RbCl$ and $MgCl_2$ (d) $MgCl_2$ and $BeCl_2$
26. Bond polarity of diatomic molecule is because of
[UPSEAT 2002]
(a) Difference in electron affinities of the two atoms
(b) Difference in electronegativities of the two atoms
(c) Difference in ionisation potential
(d) All of these

Overlapping- σ and π - bonds

1. Triple bond in ethyne is formed from
[MP PMT 1990; NCERT 1979; EAMCET 1978; AMU 1985; CPMT 1988; MADT Bihar 1982; MH CET 2000]
(a) Three sigma bonds
(b) Three pi bonds
(c) One sigma and two pi bonds
(d) Two sigma and one pi bond
2. The bond in the formation of fluorine molecule will be
[MP PMT 1987]
(a) Due to $S-S$ overlapping
(b) Due to $S-p$ overlapping
(c) Due to $p-p$ overlapping
(d) Due to hybridization
3. Which type of overlapping results the formation of a π bond
[DPMT 1981]
(a) Axial overlapping of $S-S$ orbitals
(b) Lateral overlapping of $p-p$ orbitals
(c) Axial overlapping of $p-p$ orbitals
(d) Axial overlapping of $S-p$ orbitals
4. The number and type of bonds between two carbon atoms in calcium carbide are
[AIEEE 2005]
(a) One sigma, one pi (b) One sigma, two pi
(c) Two sigma, one pi (d) Two sigma, two pi
5. In a double bond connecting two atoms, there is a sharing of
[CPMT 1977, 80, 81; NCERT 1975; Bihar MEE 1980; MP PET 1999]
(a) 2 electrons (b) 1 electron
(c) 4 electrons (d) All electrons
6. Strongest bond is
[DPMT 1990]
(a) $C-C$ (b) $C=C$
(c) $C\equiv C$ (d) All are equally strong
7. π bond is formed
[JIPMER 2002]
(a) By overlapping of atomic orbitals on the axis of nuclei
(b) By mutual sharing of pi electron
(c) By sidewise overlapping of half filled p -orbitals
(d) By overlapping of s -orbitals with p -orbitals
8. The double bond between the two carbon atoms in ethylene consists of
[NCERT 1981; EAMCET 1979]
(a) Two sigma bonds at right angles to each other
(b) One sigma bond and one pi bond
(c) Two pi bonds at right angles to each other
(d) Two pi bonds at an angle of 60° to each other
9. In the series ethane, ethylene and acetylene, the $C-H$ bond energy is
[NCERT 1977]
(a) The same in all the three compounds
(b) Greatest in ethane
(c) Greatest in ethylene
(d) Greatest in acetylene
10. In a sigma bond
(a) Sidewise as well as end to end overlap of orbitals take place
(b) Sidewise overlap of orbitals takes place
(c) End to end overlap of orbitals takes place
(d) None of the above
11. The number of sigma and pi bonds in 1-butene-3-yne are
[IIT 1989]
(a) 5 sigma and 5 pi (b) 7 sigma and 3 pi
(c) 8 sigma and 2 pi (d) 6 sigma and 4 pi
12. The most acidic compound among the following is
[MP PET 1993]

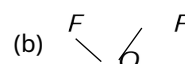
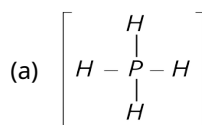
- (a) CH_3CH_2OH (b) C_6H_5OH
 (c) CH_3COOH (d) $CH_3CH_2CH_2OH$
13. Which of the following is not correct [CBSE PMT 1990]
 (a) A sigma bond is weaker than π bond
 (b) A sigma bond is stronger than π bond
 (c) A double bond is stronger than a single bond
 (d) A double bond is shorter than a single bond
14. Strongest bond formed, when atomic orbitals
 (a) Maximum overlap (b) Minimum overlap
 (c) Overlapping not done (d) None of them
15. The $p-p$ orbital overlapping is present in the following molecule [MP PET 1994]
 (a) Hydrogen (b) Hydrogen bromide
 (c) Hydrogen chloride (d) Chlorine
16. In N_2 molecule, the atoms are bonded by [MP PET 1996; UPSEAT 2001]
 (a) One σ , Two π (b) One σ , One π
 (c) Two σ , One π (d) Three σ bonds
17. In which of following there exists a $p\pi-d\pi$ bonding [AFMC 2001]
 (a) Diamond (b) Graphite
 (c) Dimethyl amine (d) Trisilylamine
18. Number of bonds in SO_2 [DCE 2001]
 (a) Two σ and two π
 (b) Two σ and one π
 (c) Two σ , two π and one lone pair
 (d) None of these
19. Which of the following has $p\pi-d\pi$ bonding [CBSE 2002]
 (a) NO_3^- (b) CO_3^{2-}
 (c) BO_3^{3-} (d) SO_3^{2-}
20. Number of sigma bonds in P_4O_{10} is [AIEEE 2002]
 (a) 6 (b) 7
 (c) 17 (d) 16

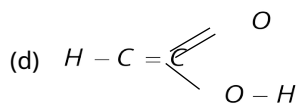
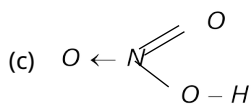
Hybridisation

1. Which molecule is not linear [CPMT 1994]
 (a) BeF_2 (b) BeH_2
 (c) CO_2 (d) H_2O
2. The bond angle in water molecule is nearly or Directed bonds in water forms an angle of [NCERT 1980; EAMCET 1981; MNR 1983, 85; AIIMS 1982; CPMT 1989; MP PET 1994, 96;

MP PET/PMT 1998]

- (a) 120° (b) 180°
 (c) $109^\circ 28'$ (d) $104^\circ 30'$
3. The central atom in a molecule is in sp^2 hybrid state. The shape of molecule will be [MP PMT 1987; CBSE PMT 1989]
 (a) Pyramidal (b) Tetrahedral
 (c) Octahedral (d) Trigonal planar
4. Which molecule is linear [MP PMT 1984; IIT 1982, 88; EAMCET 1993; CBSE PMT 1992; MP PET 1995; RPMT 1997]
 (a) NO_2 (b) ClO_2
 (c) CO_2 (d) H_2S
5. Which of the following molecules has trigonal planer geometry [CBSE PMT 2005]
 (a) IF_3 (b) PCl_3
 (c) NH_3 (d) BF_3
6. A sp^3 hybridized orbital contains [DPMT 1984; BHU 1985; CPMT 1976]
 (a) $\frac{1}{4}s$ - character (b) $\frac{1}{2}s$ - character
 (c) $\frac{2}{3}s$ - character (d) $\frac{3}{4}s$ - character
7. Structure of ammonia is [MP PMT 1987, 89, 91; CPMT 1975, 82; RPMT 1999; JIPMER 2002]
 (a) Trigonal (b) Tetrahedral
 (c) Pyramidal (d) Trigonal pyramidal
8. The bond angle in ethylene is [CPMT 1987]
 (a) 180° (b) 120°
 (c) 109° (d) 90°
9. Compound formed by sp^3d hybridization will have structure [BHU 1982; RPMT 1999]
 (a) Planar (b) Pyramidal
 (c) Angular (d) Trigonal bipyramidal
10. Which of the following formula does not correctly represent the bonding capacity of the atom involved [CBSE PMT 1990]





11. Which of the following statement is not correct

[AIIMS 1983]

- (a) Hybridization is the mixing of atomic orbitals prior to their combining into molecular orbitals
- (b) sp^2 hybrid orbitals are formed from two p atomic orbitals and one s atomic orbital
- (c) d^2sp^3 hybrid orbitals are directed towards the corners of a regular octahedron
- (d) dsp^3 hybrid orbitals are all at 90° to one another

12. The mode of hybridisation of carbon in CO_2 is [CPMT 1991]

- (a) sp
- (b) sp^2
- (c) sp^3
- (d) None of these

13. In which of the following the central atom does not use sp^3 hybrid orbitals in its bonding [MNR 1992]

- (a) BeF_3^-
- (b) OH_3^+
- (c) NH_2^-
- (d)

14. XeF_2 involves hybridisation [DPMT 1990]

- (a) sp^3
- (b) sp^3d
- (c) sp^3d^2
- (d) None of these

15. Which of the following hybridisation results in non-planar orbitals [CBSE PMT 1991]

- (a) sp^3
- (b) dsp^2
- (c) sp^2
- (d) sp

16. Octahedral molecular shape exists in hybridisation

[DPMT 1990]

- (a) sp^3d
- (b) sp^3d^2
- (c) sp^3d^3
- (d) None of these

17. The electronic structure of molecule OF_2 is a hybrid of

- (a) sp
- (b) sp^2
- (c) sp^3
- (d) sd^3

18. Percentage of s-character in sp^3 hybrid orbital is

- (a) 25
- (b) 50
- (c) 66
- (d) 75

19. Shape of XeF_4 molecule is

[BHU 1987; AFMC 1992; CET Pune 1998; Roorkee Qualifying 1998; DCE 2002]

- (a) Linear
- (b) Pyramidal
- (c) Tetrahedral
- (d) Square planar

20. For which of the following hybridisation the bond angle is maximum [CBSE PMT 1991]

- (a) sp^2
- (b) sp
- (c) sp^3
- (d) dsp^2

21. The $C-H$ bond distance is the longest in [MNR 1990]

- (a) C_2H_2
- (b) C_2H_4
- (c) $C_2H_4Br_2$
- (d) C_6H_6

22. The nature of hybridization in CH_2Cl-CH_2Cl for carbon is

- (a) sp
- (b) sp^2
- (c) sp^3
- (d) sp^2d

23. Shape of methane molecule is [MNR 1983]

- (a) Tetrahedral
- (b) Pyramidal
- (c) Octahedral
- (d) Square planar

24. Which one amongst the following possesses an sp hybridized carbon in its structure [CBSE PMT 1989]

- (a)
- (b) $C.Cl_2 = C.Cl_2$
- (c) $CH_2 = C = CH_2$
- (d) $CH_2 = CH - CH = CH_2$

25. Which of the following is the correct electronic formula of chlorine molecule [CPMT 1971]

- (a) $: \ddot{Cl} : \ddot{Cl} :$
- (b) $: \ddot{Cl}^- : : \ddot{Cl}^+ :$
- (c) $: \ddot{Cl} : \ddot{Cl} :$
- (d) $: \ddot{Cl} : : \ddot{Cl} :$

26. In XeF_4 hybridization is

- (a) sp^3d^2
- (b) sp^3
- (c) sp^3d
- (d) sp^2d

27. In $HCHO$, 'C' has hybridization [AIIMS 1987]

- (a) sp
- (b) sp^2
- (c) sp^3
- (d) All the above

28. Which has the shortest $C-C$ bond length

[NCERT 1982; CPMT 1989]

- (a) C_2H_5OH
- (b) C_2H_6

- (c) C_2H_2 (d) C_2H_4
29. The hybridization of Ag in the linear complex $[Ag(NH_3)_2]^+$ is [CPMT 1985; BHU 1981]
 (a) dsp^2 (b) sp
 (c) sp^2 (d) sp^3
30. Experiment shows that H_2O has a dipole moment while CO_2 has not. Point out the structures which best illustrate these facts [DPMT 1984; NCERT 1983; CPMT 1984]
 (a) $O = C = O$; $\begin{array}{c} \diagup \quad \diagdown \\ H \quad O \end{array}$ (b) $O = C = O$; $H - O - H$
 (c) $\begin{array}{c} \diagup \quad \diagdown \\ O \quad O \end{array}$; $H - H - O$ (d) $\begin{array}{c} O \\ || \\ C = O \end{array}$; $\begin{array}{c} H \\ | \\ O - H \end{array}$
31. Which species do not have sp^3 hybridization [DPMT 1985]
 (a) Ammonia (b) Methane
 (c) Water (d) Carbon dioxide
32. As compared to pure atomic orbitals, hybrid orbitals have
 (a) Low energy (b) Same energy
 (c) High energy (d) None of these
33. The compound 1, 2-butadiene has [IIT 1983; MP PMT 1996]
 (a) Only sp hybridized carbon atoms
 (b) Only sp^2 hybridized carbon atoms
 (c) Both sp and sp^2 hybridized carbon atoms
 (d) sp , sp^2 and sp^3 hybridized carbon atoms
34. The number of unpaired electrons in O_2 molecule is [MNR 1983; Kerala PET 2002]
 (a) 0 (b) 1
 (c) 2 (d) 3
35. In the following molecule, the two carbon atoms marked by asterisk (*) possess the following type of hybridized orbitals $H_3C - C^* \equiv C^* - CH_3$ [NCERT 1984]
 (a) sp^3 orbital (b) sp^2 orbital
 (c) sp orbital (d) s orbital
36. The bond angle in carbon tetrachloride is approximately [MNR 1981; MP PMT 1987]
 (a) 90° (b) 109°
- (c) 120° (d) 180°
37. When two pairs of electrons are shared, bond is [MNR 1979]
 (a) Single covalent bond (b) Double covalent bond
 (c) Dative bond (d) Triple bond
38. The nature of hybridization in the NH_3 molecule is [EAMCET 1982]
 (a) sp (b) sp^2
 (c) sp^3 (d) sp^3d
39. Which one of the following compounds has bond angle as nearly 90° [MP PMT 1985]
 (a) NH_3 (b) H_2S
 (c) H_2O (d) CH_4
40. In ethene, the bond angle(s) is/are [CPMT 1976; AMU 1984; MP PMT 1985]
 (a) $109^\circ 28'$ (b) 120°
 (c) 180° (d) Different
41. Structure formula of H_2O_2 is [CPMT 1993]
 (a) $\begin{array}{c} H \\ \diagup \\ O \rightarrow O \\ \diagdown \\ H \end{array}$
 (b) $H - O - O - H$ (straight line)
 (c) $\begin{array}{c} H' \\ | \\ O - O \\ | \\ H \end{array}$
 (d) $\begin{array}{c} H' \\ | \\ O - O \\ | \\ H \end{array}$
- Where $\angle H - O - O = \angle O - O - H' = 101.5^\circ$ and all the four atoms are in the same plane
- (d) $\begin{array}{c} H' \\ | \\ O - O \\ | \\ H \end{array}$
- Where $\angle H - O - O = \angle O - O - H' = 97^\circ$ and the angle between $H - O - O$ plane and $O - O - H'$ plane is 101°
42. Number of shared electrons in between carbon-carbon atoms in ethylene molecule is [MADT Bihar 1983]
 (a) 2 (b) 4
 (c) 6 (d) 3
43. The structural formula of a compound is $CH_3 - CH = C = CH_2$. The type of hybridization at the four carbons from left to right are [CBSE PMT 1989]

- (a) sp^2, sp, sp^2, sp^3 (b) sp^2, sp^3, sp^2, sp
 (c) sp^3, sp^2, sp, sp^2 (d) sp^3, sp^2, sp^2, sp^2
44. Acetate ion contains [AMU 1983]
 (a) One C, O single bond and one C, O double bond
 (b) Two C, O single bonds
 (c) Two C, O double bonds
 (d) None of the above
45. The two carbon atoms in acetylene are [AMU 1984; MADT Bihar 1982]
 (a) sp^3 hybridized (b) sp^2 hybridized
 (c) sp hybridized (d) Unhybridized
46. Among the following compounds which is planar in shape [AMU 1992]
 (a) Methane (b) Acetylene
 (c) Benzene (d) Isobutene
47. In methane the bond angle is [AMU 1983]
 (a) 180° (b) 90°
 (c) 120° (d) 109°
48. The angle between sp^2 orbitals in ethylene is [BHU 1987, 95; AMU 1985]
 (a) 90° (b) 120°
 (c) 180° (d) 109.5°
49. The species in which the central atom uses sp^2 hybrid orbitals in its bonding is [IIT 1988]
 (a) PH_3 (b) NH_3
 (c) H_3C^+ (d) SbH_3
50. Carbon atoms in diamond are bonded to each other in a configuration [CPMT 1981]
 (a) Tetrahedral (b) Planar
 (c) Linear (d) Octahedral
51. Which of the following molecules can central atom said to adopt sp^2 hybridization [CBSE PMT 1989; MP PET 1994]
 (a) BeF_2 (b) BCl_3
 (c) C_2H_2 (d) NH_3
52. In $[Cu(NH_3)_4]SO_4$; Cu has following hybridization [AIIMS 1988; UPSEAT 2001]
 (a) dsp^2 (b) sp^3
 (c) sp^2 (d) sp^3d^2
53. The hybridization of carbon atoms in $C - C$ single bond of $HC \equiv C - CH = CH_2$ is [IIT 1991; MP PET 1995]
 (a) $sp^3 - sp^3$ (b) $sp^2 - sp^3$
 (c) $sp - sp^2$ (d) $sp^3 - sp$
54. The compound in which C^+ uses sp^3 hybrids for bond formation is [IIT 1989]
 (a) $HCOOH^+$ (b) $(NH_2)_2CO^+$
 (c) $(NH_3)_3COH^+$ (d) CH_3CHO^+
55. In diborane, the $H - B - H$ bond angle is 120° . The hybridization of boron is likely to be [BHU 1981; CBSE PMT 1999]
 (a) sp (b) sp^2
 (c) sp^3 (d) dsp^2
56. The number of shared pairs of electrons in propane is [BHU 1981]
 (a) 2 (b) 4
 (c) 6 (d) 10
57. s-character in sp hybridised orbitals are
 (a) $\frac{1}{3}$ (b) $\frac{1}{2}$
 (c) $\frac{1}{4}$ (d) $\frac{2}{3}$
58. The two types of bonds present in B_2H_6 are covalent and [IIT 1994]
 (a) Three centre bond (b) Hydrogen bond
 (c) Two centre bond (d) None of the above
59. In the compound $CH_3^+OCl^-$, which type of orbitals have been used by the circled carbon in bond formation [MP PET 1994]
 (a) sp^3 (b) sp^2
 (c) sp (d) p
60. The correct order of the $O - O$ bond length in O_2 , H_2O_2 and O_3 is [CBSE PMT 1995]
 (a) $O_2 > O_3 > H_2O_2$ (b) $O_3 > H_2O_2 > O_2$
 (c) $H_2O_2 > O_3 > O_2$ (d) $O_2 > H_2O_2 > O_3$
61. The structure of PF_5 molecule is [AFMC 1995; JIPMER 2001]
 (a) Tetrahedral (b) Trigonal bipyramidal

- (c) Square planar (d) Pentagonal bipyramidal
62. Which of the following hybridisation has maximum s-character [MP PET 1995]
 (a) sp^3 (b) sp^2
 (c) sp (d) None of these
63. The PCl_5 molecule is a result of the hybridisation of [MP PET 1995; DCE 2000; MP PMT 2002]
 (a) sp^2d^2 (b) sp^3d
 (c) spd^3 (d) sp^2d^3
64. Hybridisation involves [MP PMT 1996]
 (a) Addition of an electron pair
 (b) Mixing up of atomic orbitals
 (c) Removal of an electron pair
 (d) Separation of orbitals
65. The geometry of sulphur trioxide molecule is
 (a) Tetrahedral (b) Trigonal planar
 (c) Pyramidal (d) Square planar
66. The shapes of BCl_3 , PCl_3 and ICl_3 molecules are all
 (a) Triangular (b) Pyramidal
 (c) T-shaped (d) All above are incorrect
67. In benzene molecule all C – C bond lengths are equal because
 (a) All carbon atoms are equivalent
 (b) All carbon atoms are sp^2 hybridised
 (c) All C – C bonds in benzene, have same order
 (d) All C – C bonds are single covalent bond
68. Which one is false in the following statements [MP PET 1997]
 (a) Each carbon in ethylene is in sp^2 hybridisation
 (b) Each carbon in acetylene is in sp^3 hybridisation
 (c) Each carbon in benzene is in sp^2 hybridisation
 (d) Each carbon in ethane is in sp^3 hybridisation
69. Out of the following hybrid orbitals, the one which forms the bond at angle 120° , is [MP PMT 1997]
 (a) d^2sp^3 (b) sp^3
 (c) sp^2 (d) sp
70. As the p-character increases, the bond angle in hybrid orbitals formed by s and atomic orbitals [MP PMT 1997]
 (a) Decreases (b) Increases
- (c) Doubles (d) Remains unchanged
71. sp^3 hybridization leads to which shape of the molecule [MP PET/PMT 1998]
 (a) Tetrahedron (b) Octahedron
 (c) Linear (d) Plane triangle
72. Which of the following will be octahedral [MP PET 1999]
 (a) SF_6 (b) BF_4^-
 (c) PCl_5 (d) BO_3^{3-}
73. The hybrid orbitals used by central atoms in $BeCl_2$, BCl_3 and CCl_4 molecules are respectively [MP PMT 1999]
 (a) sp^2 , sp^3 and sp (b) sp , sp^2 and sp^3
 (c) sp^3 , sp and sp^2 (d) sp^2 , sp and sp^3
74. The structure of H_2O_2 is [CBSE PMT 1999; AFMC 2003]
 (a) Planar (b) Non-planar
 (c) Spherical (d) Linear
75. Which of the following is isoelectronic as well as has same structure as that of N_2O [CPMT 1999]
 (a) N_3H (b) H_2O
 (c) NO_2 (d) CO_2
76. CCl_4 has the hybridisation [DPMT 1996]
 (a) sp^3d (b) dsp^2
 (c) sp (d) sp^3
77. Compound having planar symmetry is [DPMT 1996]
 (a) H_2SO_4 (b) H_2O
 (c) HNO_3 (d) CCl_4
78. Which of the following compounds is not linear [CPMT 1996]
 (a) $SnCl_2$ (b) HCl
 (c) CO_2 (d) $HgCl_2$
79. Which one of the following statements is true for ammonium ion [EAMCET 1997]
 (a) All bonds are ionic
 (b) All bonds are coordinate covalent
 (c) H atoms are situated at the corners of a square
 (d) H atoms are situated at the corners of a tetrahedron
80. The bond angle in sp^2 hybridisation is [RPMT 1997]

- (a) 180° (b) 120°
(c) 90° (d) $109^\circ 2'$
81. The correct order towards bond angle is [RPMT 1997]
(a) $sp < sp^2 < sp^3$
(b) $sp^2 < sp < sp^3$
(c) $sp^3 < sp^2 < sp$
(d) Bond angle does not depend on hybridisation
82. The geometry and the type of hybrid orbital present about the central atom in BF_3 is [IIT 1998; BHU 2001]
(a) Linear, sp (b) Trigonal planar, sp^2
(c) Tetrahedral, sp^3 (d) Pyramidal, sp^3
83. In graphite, electrons are [CBSE PMT 1997]
(a) Localised on every third C atom
(b) Present in antibonding orbital
(c) Localised on each C atom
(d) Spread out between the structure
84. The ammonium ion is [CET Pune 1998]
(a) Tetrahedral (b) Trigonal pyramidal
(c) Square planar (d) Square pyramidal
85. In sp hybridisation, shape is [Bihar MEE 1997]
(a) Angular (b) Tetrahedral
(c) Bipyramidal (d) Linear
(e) None of these
86. When the hybridisation state of carbon atom changes from sp^3 to sp^2 to sp , the angle between the hybridised orbitals [AIIMS 1998]
(a) Decreases gradually (b) Increases gradually
(c) Decreases considerably (d) All of these
87. The structure and hybridisation of $Si(CH_3)_4$ is [CBSE PMT 1996]
(a) Bent, sp (b) Trigonal, sp^2
(c) Octahedral, sp^3d (d) Tetrahedral, sp^3
88. The type of hybridisation of boron in diborane is [BHU 1999]
(a) sp - hybridisation (b) sp^2 - hybridisation
(c) sp^3 - hybridisation (d) sp^3d^2 - hybridisation
89. Which compound does not possess linear geometry [RPET 1999]
(a) $CH_2 = CH_2$ (b) $HC \equiv CH$
(c) $BeCl_2$ (d) CO_2
90. Which of the following molecule does not show tetrahedral shape [RPET 1999]
(a) CCl_4 (b) $SiCl_4$
(c) SF_4 (d) CF_4
91. Pyramidal shape would be of [RPET 1999]
(a) NO_3^- (b) H_2O
(c) H_3O^+ (d) NH_4^+
92. What is the correct mode of hybridization of the central atom in the following compounds : NO_2^+, SF_4, PF_6^- [AMU 1999]
(a) sp^2, sp^3, d^2sp^3 (b) sp^3, sp^3d^2, sp^3d^2
(c) sp, sp^3d, sp^3d^2 (d) sp, sp^2, sp^3
93. The hybridization in PF_3 is [DCE 2000]
(a) sp^3 (b) sp^2
(c) dsp^3 (d) d^2sp^3
94. Which of the following molecule is linear [MP PMT 2000]
(a) SO_2 (b) NO_2^+
(c) NO_2^- (d) SCl_2
95. The geometry of the molecule with sp^3d^2 hybridised central atom is [NCERT 1981; AFMC 1982; RPMT 2000]
(a) Square planar (b) Trigonal bipyramidal
(c) Octahedral (d) Square pyramidal
96. The bond angle in PH_3 is [RPMT 2000]
(a) Much less than NH_3
(b) Equal to that of NH_3
(c) Much greater than NH_3
(d) Slightly greater than NH_3
97. Which of the following has tetrahedral structure [CPMT 2000]
(a) CO_3^{2-} (b) NH_4^+
(c) $K_4[Fe(CN)_6]$ (d) None of these
98. The single, double and triple bond lengths of carbon in carbon dioxide are respectively [AIIMS 2000]
(a) 1.15, 1.22 and 1.10 Å (b) 1.22, 1.15 and 1.10 Å
(c) 1.10, 1.15 and 1.22 Å (d) 1.15, 1.10 and 1.22 Å
99. Shape of BF_3 molecule is [CPMT 2000; Pb. CET 2002]

- (a) Linear (b) Planar
(c) Tetrahedral (d) Square pyramidal
100. In the complex $[SbF_5]^{2-}$, sp^3d hybridization is present. Geometry of the complex is [Pb. PMT 2000]
(a) Square (b) Square pyramidal
(c) Square bipyramidal (d) Tetrahedral
101. The bond angle is minimum in [Pb. PMT 2001; MP PET 2003; UPSEAT 2004]
(a) H_2Te (b) H_2Se
(c) H_2O (d) H_2S
102. The correct order of hybridization of the central atom in the following species NH_3 , $[PtCl_4]^{2-}$, PCl_5 and BCl_3 is [IIT Screening 2001; BHU 2005]
(a) dsp^2 , dsp^3 , sp^2 and sp^3 (b) sp^3 , dsp^2 , dsp^3 , sp^2
(c) dsp^2 , sp^2 , sp^3 , dsp^3 (d) dsp^2 , sp^3 , sp^2 , dsp^3
103. Which of the following pairs has same structure [BHU 2001]
(a) PH_3 and BCl_3 (b) SO_2 and NH_3
(c) PCl_5 and SF_6 (d) NH_4^+ and SO_4^{2-}
104. The smallest bond angle is found in [AIIMS 2001]
(a) IF_7 (b) CH_4
(c) BeF_2 (d) BF_3
105. Which of the following is not linear [DCE 2001]
(a) CO_2 (b) ClO_2
(c) I_3^- (d) None of these
106. Which of the following is not tetrahedral [MP PMT 2001]
(a) SCl_4 (b) SO_4^{2-}
(c) $Ni(CO)_4$ (d) $NiCl_4^{2-}$
107. As the s-character of hybridisation orbital increases, the bond angle [BHU 2002; RPMT 2002]
(a) Increases (b) Decreases
(c) Becomes zero (d) Does not change
108. The shape of IF_7 molecule is [AFMC 2002; MHCET 2003]
(a) Octahedral (b) Pentagonal bipyramidal
(c) Trigonal bipyramidal (d) Tetrahedral
109. A completely filled d orbital (d^{10}) [UPSEAT 2002]
(a) Spherically symmetrical (b) Has octahedral symmetry
(c) Has tetrahedral symmetry (d) Depends on the atom
110. Which has sp^3 hybridization of central atom [UPSEAT 2002]
(a) PCl_3 (b) SO_3
(c) BF_3 (d) NO_3^-
111. In which of the following species is the interatomic bond angle is $109^\circ 28'$ [AIEEE 2002]
(a) NH_3 , $(BF_4)^{-1}$ (b) $(NH_4)^+$, BF_3
(c) NH_3 , BF_4 (d) $(NH_2)^{-1}$, BF_3
112. A square planar complex is formed by hybridisation of which atomic orbitals [AIEEE 2002]
(a) s , p_x , p_y , d_{yz} (b) s , p_x , p_y , $d_{x^2-y^2}$
(c) s , p_x , p_y , d_{z^2} (d) s , p_y , p_z , d_{xy}
113. In benzene, all the six $C - C$ bonds have the same length because of [MP PET 2002]
(a) Tautomerism (b) sp^2 hybridisation
(c) Isomerism (d) Inductive effect
114. The bond energies of $H - H$ and $Cl - Cl$ are 430 kJ mol^{-1} and 242 kJ mol^{-1} respectively, ΔH_f for HCl is 91 kJ mol^{-1} . The bond energy of HCl will be [MP PET 2003]
(a) 427 kJ (b) 766 kJ
(c) 285 kJ (d) 245 kJ
115. Which of the following has dsp^2 hybridization [MP PET 2003]
(a) $NiCl_4^{2-}$ (b) SCl_4
(c) NH_4^+ (d) $PtCl_4^{2-}$
116. Which one of the following is a planar molecule [EAMCET 2003]
(a) NH_3 (b) H_3O^+
(c) BCl_3 (d) PCl_3
117. Which one of the following is a correct set with respect to molecule, hybridisation and shape [EAMCET 2003]
(a) $BeCl_2$, sp^2 , linear
(b) $BeCl_2$, sp^2 , triangular planar
(c) BCl_3 , sp^2 , triangular planar
(d) BCl_3 , sp^3 , tetrahedral
118. Which of the following compounds doesn't have linear structure [RPET 1997, 2003]

- (a) CO_2 (b) SO_2
(c) $BeCl_2$ (d) C_2H_2
- 119.** Which of the following bonds require the largest amount of bond energy to dissociate the atom concerned
[UPSEAT 2003]
(a) $H-H$ bond in H_2 (b) $C-C$ bond in CH_4
(c) $N \equiv N$ bond in N_2 (d) $O=O$ bond in O_2
(e) $C-C$ bond in ethane
- 120.** The percentage s-character of the hybrid orbitals in methane, ethene and ethyne are respectively [KCET 2003]
(a) 25, 33, 50 (b) 25, 50, 75
(c) 50, 75, 100 (d) 10, 20, 40
- 121.** Arrange the hydra-acids of halogens in increasing order of acidity [Orissa JEE 2003]
(a) $HF < HCl < HBr < HI$ (b) $HI < HBr < HCl < HF$
(c) $HF < HBr < HI < HCl$ (d) $HF < HI < HBr < HCl$
- 122.** Which one has sp^2 – hybridisation [MP PMT 2004]
(a) CO_2 (b) N_2O
(c) SO_2 (d) CO
- 123.** Among the following compounds the one that is polar and has central atom with sp^2 – hybridization is [MP PMT 2004; IIT 1997]
(a) H_2CO_3 (b) BF_3
(c) SiF_4 (d) $HClO_2$
- 124.** The molecule which is pyramid shape is [MP PMT 2004; EAMCET 1985; IIT 1989]
(a) PCl_3 (b) CO_3^{2-}
(c) SO_3 (d) NO_3^-
- 125.** Which of the following has a linear structure [MP PMT 2004]
(a) CCl_4 (b) C_2H_2
(c) SO_2 (d) C_2H_4
- 126.** In a regular octahedral molecule, MX_6 , the number $X-M-X$ bonds at 180° is [CBSE PMT 2004]
(a) Six (b) Four
(c) Three (d) Two
- 127.** sp^3d^2 hybrid orbitals are [MP PET 2004]
(a) Linear bipyramidal (b) Pentagonal
(c) Trigonal bipyramidal (d) Octahedral
- 128.** In an octahedral structure, the pair of d orbitals involved in d^2sp^3 hybridization is [CBSE PMT 2004]
(a) d_{x^2}, d_{xz} (b) d_{xy}, d_{yz}
(c) $d_{x^2-y^2}, d_{z^2}$ (d) $d_{xz}, d_{x^2-y^2}$
- 129.** The correct order of bond angles (smallest first) in H_2S, NH_3, BF_3 and SiH_4 is [AIEEE 2004]
(a) $H_2S < NH_3 < SiH_4 < BF_3$
(b) $NH_3 < H_2S < SiH_4 < BF_3$
(c) $H_2S < SiH_4 < NH_3 < BF_3$
(d) $H_2S < NH_3 < BF_3 < SiH_4$
- 130.** Which one of the following has the regular tetrahedral structure [AIEEE 2004]
(a) BF_4^- (b) SF_4
(c) XeF_4 (d) $[Ni(CN)_4]^{2-}$
(Atomic no. : $B = 5, S = 16, Ni = 28, Xe = 54$)
- 131.** The states of hybridization of boron and oxygen atoms in boric acid (H_3BO_3) are respectively [AIEEE 2004]
(a) sp^3 and sp^2 (b) sp^2 and sp^3
(c) sp^2 and sp^2 (d) sp^3 and sp^3
- 132.** The hybridisation in BF_3 molecule is [Pb. PMT 2004]
(a) sp (b) sp^2
(c) sp^3 (d) sp^3d
- 133.** Among the compounds, BF_3, NCl_3, H_2S, SF_4 and $BeCl_2$, identify the ones in which the central atom has the same type of hybridisation [Kerala PMT 2004]
(a) BF_3 and NCl_3 (b) H_2S and $BeCl_2$
(c) BF_3, NCl_3 and H_2S (d) SF_4 and $BeCl_2$
(e) NCl_3 and H_2S
- 134.** The molecule of CO_2 has 180° bond angle. It can be explained on the basis of [AFMC 2004]
(a) sp^3 hybridisation (b) sp^2 hybridisation
(c) sp hybridisation (d) d^2sp^3 hybridisation
- 135.** sp^3 hybridisation is found in [Pb. CET 2003; Orissa JEE 2005]

- (a) CO_3^{2-} (b) BF_3
(c) NO_3^- (d) NH_3
- 136.** Which set hybridisation is correct for the following compounds [Pb. CET 2003]
 NO_2 , SF_4 , PF_6^-
(a) sp , sp^2 , sp^3
(b) sp , sp^3d , sp^3d^2
(c) sp^2 , sp^3 , d^2sp^3
(d) sp^3 , sp^3d^2 , sp^3d^2
- 137.** The state of hybridisation of B in BCl_3 is [Pb. CET 2000; BHU 2004]
(a) sp (b) sp^2
(c) sp^3 (d) sp^2d^2
- 138.** The hybrid state of sulphur in SO_3 molecule is [DCE 2004]
(a) sp^3d (b) sp^3
(c) sp^3d^2 (d) sp^2
- 139.** Which of the following molecules has pyramidal shape [DCE 2004; J&K CET 2005]
(a) PCl_3 (b) SO_3
(c) CO_3^{2-} (d) NO_3^-
- 140.** The hybridization of IF_7 is [Pb. CET 2001]
(a) sp^3d^3 (b) sp^2d
(c) d^2sp^3 (d) sp^3
- 141.** In which compound, the hydrogen bonding is the strongest in its liquid phase [Pb. CET 2001]
(a) HF (b) HI
(c) CH_4 (d) PH_3
- 142.** Geometry of ammonia molecule and the hybridization of nitrogen involved in it are [MH CET 2004]
(a) sp^3 -hybridization and tetrahedral geometry
(b) sp^3 -hybridization and distorted tetrahedral geometry
(c) sp^2 -hybridization and triangular geometry
(d) None of these
- 143.** Be in BeCl_2 undergoes [MH CET 2004]
(a) Diagonal hybridization
(b) Trigonal hybridization
(c) Tetrahedral hybridization
(d) No hybridization
- 144.** Which of the following is non-linear molecule [DCE 2003]
(a) CO_3 (b) CO_2
(c) CS_2 (d) BeCl_2
- 145.** The trigonal bipyramidal geometry results from the hybridisation [UPSEAT 2004]
(a) dsp^3 or sp^3d (b) dsp^2 or sp^2d
(c) d^2sp^3 or sp^3d^2 (d) d^3sp^2 or d^2sp^3
- 146.** The valency of carbon is four. On what principle it can be explained in a better way
(a) Resonance (b) Hybridization
(c) Electron transfer (d) None of the above
- 147.** Hybridization is due to the overlapping of [MADT Bihar 1983]
(a) Orbitals of different energy levels
(b) Orbitals of different energy content
(c) Orbitals of same energy content
(d) None of the above
- 148.** If a molecule MX_3 has zero dipole moment, the sigma bonding orbital used by M are [IIT 1981; MP PMT 1994; Kerala PMT 2004]
(a) sp^3d – hybrid (b) sp – hybrid
(c) sp^3d^2 – hybrid (d) sp^2 – hybrid
- 149.** The linear structure is assumed by [IIT 1991]
(a) SnCl_2 (b) NCO^-
(c) CS_2 (d) NO_2^+
- 150.** Hybridisation of central atom in NF_3 is [Orissa JEE 2005]
(a) sp^3 (b) sp
(c) sp^2 (d) dsp^2
- 151.** The pair having similar geometry is [J&K CET 2005]
(a) PCl_3 , NH_3 (b) BeCl_2 , H_2O
(c) CH_4 , CCl_4 (d) IF_5 , PF_5
- 152.** The d-orbital involved in sp^3d hybridisation is [J&K CET 2005]
(a) $d_{x^2-y^2}$ (b) d_{xy}
(c) d_{z^2} (d) d_{zx}

1. Which one in the following is not the resonance structure of CO_2

- (a) $O = C = O$ (b) $^-O - C \equiv O^+$
(c) $^+O \equiv C - O^-$ (d) $O \equiv C = O$

2. Which of the following molecule contains one pair of non-bonding electrons

- (a) CH_4 (b) NH_3
(c) H_2O (d) HF

3. Resonance is due to [NCERT 1981; Kurukshetra CEE 1998]

- (a) Delocalization of *sigma* electrons
(b) Delocalization of *pi* electrons
(c) Migration of *H* atoms
(d) Migration of protons

4. Resonating structures have different [AMU 1983]

(a) Atomic arrangements (b) Electronic arrangements

- (c) Functional groups (d) Alkyl groups

5. In the cyanide ion, the formal negative charge is on

[AMU 1984]

- (a) C
(b) N
(c) Both C and N
(d) Resonate between C and N

6. Which does not show resonance

[CPMT 1990]

- (a) Benzene (b) Aniline
(c) Ethyl amine (d) Toluene

7. The enolic form of acetone contains

[IIT 1990; Bihar MEE 1997]

- (a) 9 sigma bonds, 1 pi bond and 2 lone pairs
(b) 8 sigma bonds, 2 pi bonds and 2 lone pairs
(c) 10 sigma bonds, 1 pi bond and 1 lone pair
(d) 9 sigma bonds, 2 pi bonds and 1 lone pair

8. Point out incorrect statement about resonance

[MP PET 1997]

- (a) Resonance structures should have equal energy
(b) In resonance structures, the constituent atoms should be in the same position
(c) In resonance structures, there should not be the same number of electron pairs
(d) Resonance structures should differ only in the location of electrons around the constituent atoms

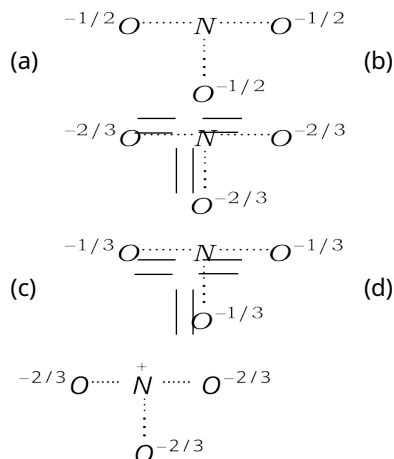
9. The number of possible resonance structures for CO_3^{2-} is

[MP PMT 2000]

- (a) 2 (b) 3
(c) 6 (d) 9

10. Resonance hybrid of nitrate ion is

[RPET 2000]



11. CO_3^{2-} anion has which of the following characteristics

[Roorkee 1999]

- (a) Bonds of unequal length
(b) sp^2 hybridization of C atom
(c) Resonance stabilization
(d) Same bond angles

VSEPR Theory

1. The structure of $[Cu(H_2O)_4]^{+2}$ ion is

[NCERT 1983; MP PMT 1983]

- (a) Square planar (b) Tetrahedral
(c) Distorted rectangle (d) Octahedral

2. The bond angle in PH_3 would be expected to be close to

- (a) 90° (b) 105°
(c) 109° (d) 120°

3. In which molecule are all atoms coplanar [MP PMT 1994]

- (a) CH_4 (b) BF_3
(c) PF_3 (d) NH_3

4. Which has the least bond angle [NCERT 1973; DPMT 1990; CBSE PMT 1990; UPSEAT 2003]

- (a) NH_3 (b) BeF_2
(c) H_2O (d) CH_4

5. In compound X , all the bond angles are exactly $109^\circ 28'$, X is [CBSE PMT 1991]
 (a) Chloromethane (b) Iodoform
 (c) Carbon tetrachloride (d) Chloroform
6. The shape of SO_4^{2-} ion is [CPMT 1982; DPMT 1983, 84, 96; Bihar MEE 1997]
 (a) Square planar (b) Tetrahedral
 (c) Trigonal bipyramidal (d) Hexagonal
7. Which of the following molecules has one lone pair of electrons on the central atom [EAMCET 1980; AMU 1982; MNR 1989]
 (a) H_2O (b) NH_3
 (c) CH_4 (d) PCl_5
8. Of the following compounds, the one having a linear structure is [NCERT 1981; CPMT 1991; DPMT 1982; MP PMT 1985; AIIMS 1996]
 (a) NH_2 (b) CH_4
 (c) C_2H_2 (d) H_2O
9. XeF_6 is
 (a) Octahedral (b) Distorted octahedral
 (c) Planar (d) Tetrahedral
10. Which has maximum bond angle [CPMT 1993]
 (a) CHF_3
 (b) $CHCl_3$
 (c) $CHBr_3$
 (d) All have maximum bond angle
11. Of the following species the one having a square planar structure is [NCERT 1981; MP PMT 1994]
 (a) NH_4^+ (b) BF_4^-
 (c) XeF_4 (d) SCl_4
12. In which of the following is the angle between the two covalent bonds greatest [NCERT 1975; AMU 1982; MNR 1987; IIT 1981; CPMT 1988; MP PMT 1994]
 (a) CO_2 (b) CH_4
 (c) NH_3 (d) H_2O
13. As the s-character of hybridized orbital decreases, the bond angle [DPMT 1986]
 (a) Decreases (b) Increases
 (c) Does not change (d) Becomes zero
14. XeF_2 molecule is [BHU 1982]
 (a) Linear (b) Triangular planar
 (c) Pyramidal (d) Square planar
15. Of the following sets which one does NOT contain isoelectronic species [AIEEE 2005]
 (a) PO_4^{3-} , SO_4^{2-} , ClO_4^- (b) CN^- , N_2 , C_2^{2-}
 (c) SO_3^{2-} , CO_3^{2-} , NO_3^- (d) BO_3^{3-} , CO_3^{2-} , NO_3^-
16. A molecule which contains unpaired electrons is [NCERT 1982]
 (a) Carbon monoxide (b) Molecular nitrogen
 (c) Molecular oxygen (d) Hydrogen peroxide
17. H_2O is [MADT Bihar 1983]
 (a) A linear triatomic molecule
 (b) A bent (angular) triatomic molecule
 (c) Both of these
 (d) None of these
18. Bond angle between two hybrid orbitals is 105° . % s-orbital character of hybrid orbital is [MP PMT 1986]
 (a) Between 20 – 21% (b) Between 19 – 20%
 (c) Between 21 – 22% (d) Between 22 – 23%
19. The bond angle between $H-O-H$ in ice is closest to [CPMT 1989; UPSEAT 2002]
 (a) $120^\circ 28'$ (b) 60°
 (c) 90° (d) 105°
20. Which of the following molecules does not have a linear arrangement of atoms [CBSE PMT 1989]
 (a) H_2S (b) C_2H_2
 (c) BeH_2 (d) CO_2
21. BCl_3 is a planar molecule while NCl_3 is pyramidal, because [CBSE PMT 1995]
 (a) BCl_3 has no lone pair of electrons but NCl_3 has a lone pair of electrons
 (b) $B-Cl$ bond is more polar than $N-Cl$ bond
 (c) Nitrogen atom is smaller than boron atom
 (d) $N-Cl$ bond is more covalent than $B-Cl$ bond
22. The isoelectronic pair is [AIIMS 2005]
 (a) Cl_2O , ICl_2^- (b) ICl_2^- , ClO_2
 (c) IF_2^+ , I_3^- (d) ClO_2^- , CIF_2^+
23. According to VSEPR theory, the most probable shape of the molecule having 4 electron pairs in the outer shell of the central atom is [MP PET 1996, 2001]
 (a) Linear (b) Tetrahedral
 (c) Hexahedral (d) Octahedral

24. The molecular shapes of SF_4 , CF_4 and XeF_4 are [AIEEE 2005]
 (a) The same with 2, 0 and 1 lone pairs of electrons on the central atom, respectively
 (b) The same with 1, 1 and 1 lone pair of electrons on the central atoms, respectively
 (c) Different with 0, 1 and 2 lone pairs of electrons on the central atom, respectively
 (d) Different with 1, 0 and 2 lone pairs of electrons on the central atom, respectively
25. Which of the following species is planar [JIPMER 1997]
 (a) CO_3^{2-} (b) NH_2
 (c) PCl_3 (d) None of these
26. The shape of CH_3^+ species is [RPET 1999]
 (a) Tetrahedral (b) Square planar
 (c) Trigonal planar (d) Linear
27. Which of the following is the correct reducing order of bond-angle [BHU 2000]
 (a) $NH_3 < CH_4 < C_2H_2 < H_2O$
 (b) $C_2H_2 > NH_3 > H_2O < CH_4$
 (c) $NH_3 > H_2O > CH_4 < C_2H_2$
 (d) $H_2O < NH_3 > CH_4 < C_2H_2$
28. Which compound has bond angle nearly to 90° [Pb. PMT 2001]
 (a) H_2O (b) H_2S
 (c) NH_3 (d) CH_4
29. A lone pair of electrons in an atom implies [KCET 2002]
 (a) A pair of valence electrons not involved in bonding
 (b) A pair of electrons involved in bonding
 (c) A pair of electrons
 (d) A pair of valence electrons
30. The bond angle of water is 104.5° due to [CPMT 2002]
 (a) Repulsion between lone pair and bond pair
 (b) sp^3 hybridization of O
 (c) Bonding of H_2O
 (d) Higher electronegativity of O
31. The correct sequence of decrease in the bond angle of the following hydrides is [MP PET 2002]
 (a) $NH_3 > PH_3 > AsH_3 > SbH_3$
 (b) $NH_3 > AsH_3 > PH_3 > SbH_3$
 (c) $SbH_3 > AsH_3 > PH_3 > NH_3$
 (d) $PH_3 > NH_3 > AsH_3 > SbH_3$
32. Central atom of the following compound has one lone pair of electrons and three bond pairs of electrons [JIPMER 2002]
 (a) H_2S (b) $AlCl_3$
 (c) NH_3 (d) BF_3
33. Among KO_2 , AlO_2^- , BaO_2 and NO_2^+ unpaired electron is present in [MP PET 2003]
 (a) NO_2^+ and BaO_2 (b) KO_2 and AlO_2^-
 (c) KO_2 only (d) BaO_2 only
34. True order of bond angle is [RPET 2003]
 (a) $H_2O > H_2S > H_2Se > H_2Te$
 (b) $H_2Te > H_2Se > H_2S > H_2O$
 (c) $H_2S > H_2O > H_2Se > H_2Te$
 (d) $H_2O > H_2S > H_2Te > H_2Se$
35. Which of the following has not a lone pair over the central atom [Orissa JEE 2003]
 (a) NH_3 (b) PH_3
 (c) BF_3 (d) PCl_3
36. In BrF_3 molecule, the lone pairs occupy equatorial positions to minimize [CBSE PMT 2004]
 (a) Lone pair- lone pair repulsion and lone pair-bond pair repulsion
 (b) Lone pair- lone pair repulsion only
 (c) Lone pair- bond pair repulsion only
 (d) Bond pair- bond pair repulsion only
37. H_2O is dipolar, whereas BeF_2 is not. It is because [CBSE PMT 1989; 2004]
 (a) H_2O is linear and BeF_2 is angular
 (b) H_2O is angular and BeF_2 is linear
 (c) The electronegativity of F is greater than that of O
 (d) H_2O involves hydrogen bonding whereas BeF_2 is a discrete molecule
38. Maximum bond angle is present in [BVP 2004]
 (a) BCl_3 (b) BBr_3
 (c) BF_3 (d) Same for all
39. The shape of a molecule of NH_3 , in which central atom contains lone pair of electron, is [MHCET 2003]
 (a) Tetrahedral (b) Planar trigonal
 (c) Square planar (d) Pyramidal
40. The largest bond angle is in [DCE 2002; MNR 1984]
 (a) AsH_3 (b) NH_3

- (c) H_2O (d) PH_3
41. The bond angle in ammonia molecule is [EAMCET 1980]
 (a) $91^\circ 8'$ (b) $93^\circ 3'$
 (c) $106^\circ 45'$ (d) $109^\circ 28'$
42. Which of the following gives correct arrangement of compounds involved based on their bond strength [BHU 2005]
 (a) $HF > HCl > HBr > HI$
 (b) $HI > HBr > HCl > HF$
 (c) $HF > HBr > HCl > HI$
 (d) $HCl > HF > HBr > HI$
43. Which one has a pyramidal structure [CBSE PMT 1990]
 (a) CH_4 (b) NH_3
 (c) H_2O (d) CO_2
44. Among the following the pair in which the two species are not isostructural is [CBSE PMT 2004]
 (a) BH_4^- and NH_4^+ (b) PF_6^- and SF_6
 (c) SiF_4 and SF_4 (d) IO_3^- and XeO_3
45. The maximum number of 90° angles between bond pair-bond pair of electrons is observed in [AIEEE 2004]
 (a) dsp^2 hybridization (b) sp^3d hybridization
 (c) dsp^3 hybridization (d) sp^3d^2 hybridization

Molecular orbital theory

1. Bond order is a concept in the molecular orbital theory. It depends on the number of electrons in the bonding and antibonding orbitals. Which of the following statements is true about it? The bond order [AIIMS 1980]
 (a) Can have a negative quantity
 (b) Has always an integral value
 (c) Can assume any positive or integral or fractional value including zero
 (d) Is a non zero quantity
2. The bond order of NO molecule is [MP PET 1996]
 (a) 1 (b) 2
 (c) 2.5 (d) 3
3. When two atomic orbitals combine they form
 (a) One molecular orbital (b) Two molecular orbital
 (c) Three molecular orbital (d) Four molecular orbital
4. Which of the following species is the least stable
 (a) O_2 (b) O_2^{-2}

- (c) O_2^{+1} (d) O_2^{-1}
5. The bond order is maximum in [AIIMS 1983, 85; CBSE PMT 1994; MP PET 2002]
 (a) O_2 (b) O_2^{-1}
 (c) O_2^{+1} (d) O_2^{-2}
6. Which of the following compounds of boron does not exist in the free form
 (a) BCl_3 (b) BF_3
 (c) BBr_3 (d) BH_3
7. Molecular orbital theory was developed mainly by [BHU 1987; Pb. CET 2003]
 (a) Pauling (b) Pauling and Slater
 (c) Mulliken (d) Thomson
8. The bond order of a molecule is given by [NCERT 1984]
 (a) The difference between the number of electrons in bonding and antibonding orbitals
 (b) Total number of electrons in bonding and antibonding orbitals
 (c) Twice the difference between the number of electrons in bonding and antibonding electrons
 (d) Half the difference between the number of electrons in bonding and antibonding electrons
9. Oxygen molecule is paramagnetic because [NCERT 1984; IIT 1984]
 (a) Bonding electrons are more than antibonding electrons
 (b) Contains unpaired electrons
 (c) Bonding electrons are less than antibonding electrons
 (d) Bonding electrons are equal to antibonding electrons
10. Which one is paramagnetic from the following [IIT 1989; CBSE PMT 1995]
 (a) O_2^- (b) NO
 (c) Both (a) and (b) (d) CN^-
11. The bond order in N_2^+ ion is [Pb. CET 2004]
 (a) 1 (b) 2
 (c) 2.5 (d) 3
12. Out of the following which has smallest bond length [RPMT 1997]
 (a) O_2 (b) O_2^+
 (c) O_2^- (d) O_2^{2-}
13. Which of the following molecule is paramagnetic [CPMT 1980; RPET 1999; MP PMT 1999; RPMT 2000]

- (a) Chlorine (b) Nitrogen
(c) Oxygen (d) Hydrogen
14. Which molecule has the highest bond order
(a) N_2 (b) Li_2
(c) He_2 (d) O_2
15. The molecular electronic configuration of H_2^- ion is
(a) $(\sigma 1s)^2$ (b) $(\sigma 1s)^2(\sigma^* 1s)^2$
(c) $(\sigma 1s)^1$ (d) $(\sigma 1s)^3$
16. The paramagnetic nature of oxygen molecule is best explained on the basis of [BHU 1996]
(a) Valence bond theory (b) Resonance
(c) Molecular orbital theory (d) Hybridization
17. In which case the bond length is minimum between carbon and nitrogen
(a) CH_3NH_2 (b) $C_6H_5CH=NOH$
(c) CH_3CONH_2 (d) CH_3CN
18. Which one of the following species is diamagnetic in nature [AIEEE 2005]
(a) He_2^+ (b) H_2
(c) H_2^+ (d) H_2^-
19. Which one of the following oxides is expected exhibit paramagnetic behaviour [CBSE PMT 2005]
(a) CO_2 (b) SO_2
(c) ClO_2 (d) SiO_2
20. The bond order in N_2 molecule is [CBSE 1995; Pb. PMT 1999; MP PET 1997]
(a) 1 (b) 2
(c) 3 (d) 4
21. Which one is paramagnetic and has the bond order 1/2 [NCERT 1983]
(a) O_2 (b) N_2
(c) F_2 (d) H_2^+
22. When two atoms of chlorine combine to form one molecule of chlorine gas, the energy of the molecule [AMU 1982]
(a) Greater than that of separate atoms
(b) Equal to that of separate atoms
(c) Lower than that of separate atoms
(d) None of the above statement is correct
23. An atom of an element A has three electrons in its outermost shell and that of B has six electrons in the outermost shell. The formula of the compound between these two will be [CPMT 1974, 84; RPMT 1999]
(a) A_3B_4 (b) A_2B_3
(c) A_3B_2 (d) A_2B
24. The bond order of individual carbon-carbon bonds in benzene is [IIT 1980]
(a) One (b) Two
(c) Between 1 and 2 (d) One and two alternately
25. PCl_5 exists but NCl_5 does not because [EAMCET 1977; MP PET/PMT 1988]
(a) Nitrogen has no vacant d-orbitals
(b) NCl_5 is unstable
(c) Nitrogen atom is much smaller
(d) Nitrogen is highly inert
26. Paramagnetism is exhibited by molecules [NCERT 1979; MP PET 2002]
(a) Not attracted into a magnetic field
(b) Containing only paired electrons
(c) Carrying a positive charge
(d) Containing unpaired electrons
27. Which one of the following is paramagnetic [DPMT 1985]
(a) H_2O (b) NO_2
(c) SO_2 (d) CO_2
28. The energy of a $2p$ orbital except hydrogen atom is [AMU 1983]
(a) Less than that of $2s$ orbital
(b) More than that of $2s$ orbital
(c) Equal to that of $2s$ orbital
(d) Double that of $2s$ orbital
29. In the electronic structure of acetic acid, there are [AMU 1983]
(a) 16 shared and 8 unshared electrons
(b) 8 shared and 16 unshared electrons
(c) 12 shared and 12 unshared electrons
(d) 18 shared and 6 unshared electrons
30. Which of the following does not exist on the basis of molecular orbital theory [AFMC 1990; MP PMT 1996]
(a) H_2^+ (b) He_2^+
(c) He_2 (d) Li_2
31. In P_4O_{10} , the number of oxygen atoms attached to each phosphorus atom is [IIT 1995]
(a) 2 (b) 3

- (c) 4 (d) 2.5
32. Of the following statements which one is correct
- Oxygen and nitric oxide molecules are both paramagnetic because both contain unpaired electrons
 - Oxygen and nitric oxide molecules are both diamagnetic because both contain no unpaired electrons
 - Oxygen is paramagnetic because it contains unpaired electrons, while nitric oxide is diamagnetic because it contains no unpaired electrons
 - Oxygen is diamagnetic because it contains no unpaired electrons, while nitric oxide is paramagnetic because it contains an unpaired electron
33. According to the molecular orbital theory, the bond order in C_2 molecule is
- 0
 - 1
 - 2
 - 3
34. The molecular orbital configuration of a diatomic molecule is
- $$\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_x^2 \left\{ \begin{array}{l} \pi 2p_y^2 \\ \pi 2p_z^2 \end{array} \right.$$
- Its bond order is
- 3
 - 2.5
 - 2
 - 1
35. The difference in energy between the molecular orbital formed and the combining atomic orbitals is called
- Bond energy
 - Activation energy
 - Stabilization energy
 - Destabilization energy
36. According to molecular orbital theory, the paramagnetism of O_2 molecule is due to presence of [MP PMT 1997]
- Unpaired electrons in the bonding σ molecular orbital
 - Unpaired electrons in the antibonding σ molecular orbital
 - Unpaired electron in the bonding π molecular orbital
 - Unpaired electrons in the antibonding π molecular orbital
37. The bond order in O_2^+ is [MP PET 1999; BHU 2001]
- 2
 - 2.5
 - 1.5
 - 3
38. Which of the following is paramagnetic [MP PET 1999]
- O_2
 - CN^-
 - CO
 - NO^+
39. If N_x is the number of bonding orbitals of an atom and N_y is the number of antibonding orbitals, then the molecule/atom will be stable if [DPMT 1996]
- $N_x > N_y$
 - $N_x = N_y$
 - $N_x < N_y$
 - $N_x \leq N_y$
40. Which of the following molecular orbitals has two nodal planes [KCET 1996]
- $\sigma 2s$
 - $\pi 2p_y$
 - $\pi^* 2p_y$
 - $\sigma^* 2p_x$
41. The number of nodal planes 'd' orbital has [KCET 1996]
- Zero
 - One
 - Two
 - Three
42. Atomic number of an element is 26. The element shows [CPMT 1996]
- Ferromagnetism
 - Diamagnetism
 - Paramagnetism
 - None of these
43. What is correct sequence of bond order [BHU 1997]
- $O_2^+ > O_2^- > O_2$
 - $O_2^+ > O_2 > O_2^-$
 - $O_2 > O_2^- > O_2^+$
 - $O_2^- > O_2^+ > O_2$
44. Which bond is strongest [RPMT 1997]
- $F - F$
 - $Br - F$
 - $Cl - F$
 - $I - F$
45. Which of the following is not paramagnetic [AIIMS 1997]
- S^{-2}
 - N_2^-
 - O_2^-
 - NO
46. Which one of the following molecules is paramagnetic [Pb. PMT 1998]
- CO_2
 - SO_2
 - NO
 - H_2O

47. N_2 and O_2 are converted into monoanions N_2^- and O_2^- respectively, which of the following statements is wrong
[CBSE PMT 1997]
- (a) In N_2 , the $N-N$ bond weakens
(b) In O_2 , the $O-O$ bond order increases
(c) In O_2 , bond length increases
(d) N_2^- becomes diamagnetic
48. With increasing bond order, stability of a bond
[CET Pune 1998]
- (a) Remains unaltered (b) Decreases
(c) Increases (d) None of these
49. Which is not paramagnetic [DCE 1999, 2000]
- (a) O_2 (b) O_2^+
(c) O_2^{2-} (d) O_2^-
50. The number of antibonding electron pairs in O_2^{2-} molecular ion on the basis of molecular orbital theory is
[Pb. PMT 2000]
- (a) 4 (b) 3
(c) 2 (d) 5
51. The bond order of He_2^+ molecule ion is
[Pb. PMT 2000; Pb CET 2001]
- (a) 1 (b) 2
(c) $\frac{1}{2}$ (d) $\frac{1}{4}$
52. Which one does not exhibit paramagnetism [DPMT 2000]
- (a) ClO_2 (b) ClO_2^-
(c) NO_2 (d) NO
53. In which of the following pairs the two molecules have identical bond order [MP PMT 2000]
- (a) N_2, O_2^{2+} (b) N_2, O_2^-
(c) N_2^-, O_2 (d) O_2^+, N_2
54. The bond order is not three for [MP PMT 2001]
- (a) N_2^+ (b) O_2^{2+}
(c) N_2 (d) NO^+
55. In H_2O_2 molecule, the angle between the two $O-H$ planes is
[CBSE PMT 2002]
- (a) 90° (b) 101° (c) 103° (d) 105°
56. Which of the following molecule has highest bond energy [AIIMS 2002]
- (a) $F-F$ (b) $C-C$
(c) $N-N$ (d) $O-O$
57. Which of the following species would be expected paramagnetic [UPSEAT 2002]
- (a) Copper crystals (b) Cu^+
(c) Cu^{++} (d) H_2
58. Which of the following is correct for N_2 triple bond [CPMT 2002]
- (a) $3s$ (b) $1p, 2s$
(c) $2p, 1s$ (d) $3p$
59. In which of the following pairs molecules have bond order three and are isoelectronics [MP PET 2003]
- (a) CN^-, CO (b) NO^+, CO^+
(c) CN^-, O_2^+ (d) CO, O_2^+
60. Which of the following is paramagnetic [MP PET 2003]
- (a) O_2^+ (b) CN^-
(c) CO (d) N_2
61. How many bonding electron pairs are there in white phosphorous [MP PET 2003]
- (a) 6 (b) 12
(c) 4 (d) 8
62. The atomicity of phosphorus is X and the $P\hat{P}P$ bond angle in the molecule is Y . What are X and Y [EAMCET 2003]
- (a) $X=4, Y=90^\circ$ (b) $X=4, Y=60^\circ$
(c) $X=3, Y=120^\circ$ (d) $X=2, Y=180^\circ$
63. From elementary molecular orbital theory we can give the electronic configuration of the singly positive nitrogen molecular ion N_2^+ as [UPSEAT 2003]
- (a) $\sigma(1s)^2 \sigma^*(1s)^2 \sigma(2s)^2 \sigma^*(2s)^2 \pi(2p)^4 \sigma(2p)^1$
(b) $\sigma(1s)^2 \sigma^*(1s)^2 \sigma(2s)^2 \sigma^*(2s)^2 \sigma(2p)^1 \pi(2p)^3$
(c) $\sigma(1s)^2 \sigma^*(1s)^2 \sigma(2s)^2 \sigma^*(2p)^2 \pi(2p)^4$
(d) $\sigma(1s)^2 \sigma^*(1s)^2 \sigma(2s)^2 \sigma^*(2s)^2 \sigma(2p)^2 \pi(2p)^2$
64. The paramagnetic property of the oxygen molecule due to the presence of unpaired electrons present in [Kerala PMT 2004]

- (a) $(\sigma 2p_x)^1$ and $(\sigma^* 2p_x)^1$
 (b) $(\sigma 2p_x)^1$ and $(\pi 2p_y)^1$
 (c) $(\pi^* 2p_y)^1$ and $(\pi^* 2p_z)^1$
 (d) $(\pi^* 2p_y)^1$ and $(\pi 2p_y)^1$
 (e) $(\pi^* 2p_z)^1$ and $(\pi 2p_z)^1$
65. In PO_4^{3-} ion, the formal charge on each oxygen atom and $P-O$ bond order respectively are [DPMT 2004]
 (a) $-0.75, 1.25$ (b) $-0.75, 1.0$
 (c) $-0.75, 0.6$ (d) $-3, 1.25$
66. The bond order in CO_3^{2-} ion between $C-O$ is [Pb. PMT 2004]
 (a) Zero (b) 0.88
 (c) 1.33 (d) 2
67. The bond order of O_2^+ is the same as in [CPMT 2004]
 (a) N_2 (b) CN^-
 (c) CO (d) NO^+
68. Bond order of O_2 is [DPMT 2004]
 (a) 2 (b) 1.5
 (c) 3 (d) 3.5
69. The total number of electron that takes part in forming bonds in N_2 is [MP PET 2004]
 (a) 2 (b) 4
 (c) 6 (d) 10
70. The bond length the species O_2, O_2^+ and O_2^- are in the order of [MP PET 2004]
 (a) $O_2^+ > O_2 > O_2^-$ (b) $O_2^+ > O_2^- > O_2$
 (c) $O_2 > O_2^+ > O_2^-$ (d) $O_2^- > O_2 > O_2^+$
71. According to molecular orbital theory which of the following statement about the magnetic character and bond order is correct regarding O_2^+ [IIT JEE Screening 2004]
 (a) Paramagnetic and bond order $< O_2$
 (b) Paramagnetic and bond order $> O_2$
 (c) Dimagnetic and bond order $< O_2$
 (d) Dimagnetic and bond order $> O_2$
72. The bond order in NO is 2.5 while that in NO^+ is 3. Which of the following statements is true for these two species [AIEEE 2004]
 (a) Bond length in NO^+ is equal to that in NO
 (b) Bond length in NO is greater than in NO^+
 (c) Bond length in NO^+ is greater than in NO
 (d) Bond length is unpredictable
73. Which of the following is diamagnetic [BVP 2004]
 (a) Oxygen molecule (b) Boron molecule
 (c) N_2^+ (d) None
74. Bond energies in NO, NO^+ and NO^- are such as [Pb. CET 2004]
 (a) $NO^- > NO > NO^+$ (b) $NO > NO^- > NO^+$
 (c) $NO^+ > NO > NO^-$ (d) $NO^+ > NO^- > NO$
75. Which of the following is paramagnetic [UPSEAT 2004]
 (a) B_2 (b) C_2
 (c) N_2 (d) F_2
76. The paramagnetic molecule at ground state among the following is [UPSEAT 2004]
 (a) H_2 (b) O_2
 (c) N_2 (d) CO
77. Which has the highest bond energy [DCE 2002]
 (a) F_2 (b) Cl_2
 (c) Br_2 (d) I_2
78. In O_2^-, O_2 and O_2^{2-} molecular species, the total number of antibonding electrons respectively are [DCE 2003]
 (a) 7, 6, 8 (b) 1, 0, 2
 (c) 6, 6, 6 (d) 8, 6, 8
79. Which of the following is not paramagnetic [DCE 2002]
 (a) O_2 (b) O_2^{2+}
 (c) O_2^{2-} (d) O_2^-
80. Which of the following species have maximum number of unpaired electrons [AIIMS 1983]
 (a) O_2 (b) O_2^+
 (c) O_2^- (d) O_2^{2-}
81. The correct order in which the $O-O$ bond length increases in the following is [BHU 2000; CBSE PMT 2005]
 (a) $H_2O_2 < O_2 < O_3$ (b) $O_2 < H_2O_2 < O_3$
 (c) $O_2 < O_3 < H_2O_2$ (d) $O_3 < H_2O_2 < O_2$
82. Correct order of bond length is [Orissa JEE 2005]
 (a) $CO_3^{2-} > CO_2 > CO$ (b) $CO_2 > CO > CO_3^{2-}$
 (c) $CO > CO_2 > CO_3^{2-}$ (d) None of these
83. Which of the following is paramagnetic [DPMT 2005]
 (a) N_2 (b) C_2

- (c) N_2^+ (d) O_2^{2-}

84. Among the following molecules which one have smallest bond angle [Orissa JEE 2005]

- (a) NH_3 (b) PH_3
(c) H_2O (d) H_2S
(e) H_2S

Hydrogen bonding

1. In the following which bond will be responsible for maximum value of hydrogen bond

- (a) $O-H$ (b) $N-H$
(c) $S-H$ (d) $F-H$

2. In which of the following hydrogen bond is present

- (a) H_2 (b) Ice
(c) Sulphur (d) Hydrocarbon

3. In the following which has highest boiling point

[MP PMT 1989; RPMT 1997]

- (a) HI (b) HF
(c) HBr (d) HCl

4. Which contains hydrogen bond

[MP PMT 1989]

- (a) HF (b) HCl
(c) HBr (d) HI

5. Contrary to other hydrogen halides, hydrogen fluoride is a liquid because [MP PMT 1990; AMU 1983; EAMCET 1980]

- (a) Size of F atom is small
(b) HF is a weak acid
(c) HF molecule are hydrogen bonded
(d) Fluorine is highly reactive

6. In the following which species does not contain sp^3 hybridization [DPMT 1985]

- (a) NH_3 (b) CH_4
(c) H_2O (d) CO_2

7. As a result of sp hybridization, we get [IIT 1984]

- (a) Two mutual perpendicular orbitals
(b) Two orbitals at 180°
(c) Four orbitals in tetrahedral directions
(d) Three orbitals in the same plane

8. The reason for exceptionally high boiling point of water is

[DPMT 1986; NCERT 1976; AMU 1984; EAMCET 1979;

MP PMT 1993; AIIMS 1996; KCET 2001; CPMT 2003]

- (a) Its high specific heat
(b) Its high dielectric constant
(c) Low ionization of water molecules
(d) Hydrogen bonding in the molecules of water

9. Which concept best explains that *o*-nitrophenol is more volatile than *p*-nitrophenol

[AIIMS 1980, 82; Kurukshetra CEE 1998; MP PET 2002]

- (a) Resonance (b) Hyperconjugation
(c) Hydrogen bonding (d) Steric hindrance

10. Which contains strongest $H-H$ bond

[IIT 1986; MP PET 1997, 2003; UPSEAT 2001, 03]

- (a) $O-H \cdots S$ (b) $S-H \cdots O$
(c) $F-H \cdots F$ (d) $F-H \cdots O$

11. Which of the following compound can form hydrogen bonds

[NCERT 1978; MP PMT 1997]

- (a) CH_4 (b) $NaCl$
(c) $CHCl_3$ (d) H_2O

12. Of the following hydrides which has the lowest boiling point

[CBSE PMT 1987]

- (a) NH_3 (b) PH_3
(c) SbH_3 (d) AsH_3

13. The pairs of bases in DNA are held together by

[NCERT 1978; DPMT 1985; CBSE PMT 1992]

- (a) Hydrogen bonds (b) Ionic bonds
(c) Phosphate groups (d) Deoxyribose groups

14. Water has high heat of vaporisation due to [AFMC 1982]

- (a) Covalent bonding (b) $H-H$ bonding
(c) Ionic bonding (d) None of the above

15. In which of the following compounds does hydrogen bonding occur [CBSE PMT 1989]

- (a) SiH_4 (b) LiH
(c) HI (d) NH_3

16. Which among the following compounds does not show hydrogen bonding [MP PMT 1989]

- (a) Chloroform (b) Ethyl alcohol
(c) Acetic acid (d) Ethyl ether

17. Acetic acid exists as dimer in benzene due to [CPMT 1982]

- (a) Condensation reaction
(b) Hydrogen bonding
(c) Presence of carboxyl group
(d) Presence of hydrogen atom at α - carbon
18. Which one among the following does not have the hydrogen bond [IIT 1983; MP PMT 1994; UPSEAT 2001]
(a) Phenol (b) Liquid NH_3
(c) Water (d) Liquid HCl
19. The bond that determines the secondary structure of a protein is [NCERT 1984; MP PET 1996]
(a) Coordinate bond (b) Covalent bond
(c) Hydrogen bond (d) Ionic bond
20. HCl is a gas but HF is a low boiling liquid. This is because [NCERT 1984; MP PMT 2001]
(a) $H - F$ bond is strong
(b) $H - F$ bond is weak
(c) Molecules aggregate because of hydrogen bonding
(d) HF is a weak acid
21. The relatively high boiling point of HF is due to [NCERT 1984]
(a) Hydrogen bonding
(b) Covalent bonding
(c) Unshared electron pair on F
(d) Being a halogen acid
22. Water is liquid due to [MADT Bihar 1983]
(a) Hydrogen bonding (b) Covalent bond
(c) Ionic bond (d) Vander Waals forces
23. The maximum possible number of hydrogen bonds in which an H_2O molecule can participate is [MP PMT 1986; MNR 1991; IIT 1992; MP PET 1999]
(a) 1 (b) 2
(c) 3 (d) 4
24. Hydrogen bonding is maximum in [IIT 1987; MP PMT 1991; MP PET 1993, 2001; MNR 1995; CPMT 1999; KCET (Med.) 2002]
(a) Ethanol (b) Diethyl ether
(c) Ethyl chloride (d) Triethyl amine
25. The hydrogen bond is strongest in [BHU 1987; CBSE PMT 1990, 92]
(a) Water (b) Ammonia
(c) Hydrogen fluoride (d) Acetic acid
26. The high boiling point of ethanol ($78.2^\circ C$) compared to dimethyl ether ($-23.6^\circ C$), though both having the same molecular formulae C_6H_6O , is due to [MP PMT 1993]
(a) Hydrogen bonding
(b) Ionic bonding
(c) Coordinate covalent bonding
(d) Resonance
27. Methanol and ethanol are miscible in water due to [CPMT 1989]
(a) Covalent character
(b) Hydrogen bonding character
(c) Oxygen bonding character
(d) None of these
28. B.P. of H_2O ($100^\circ C$) and H_2S ($-42^\circ C$) explained by
(a) Vander Waal's forces (b) Covalent bond
(c) Hydrogen bond (d) Ionic bond
29. Strength of hydrogen bond is intermediate between [DPMT 1991]
(a) Vander Waal and covalent
(b) Ionic and covalent
(c) Ionic and metallic
(d) Metallic and covalent
30. In which of the following compounds intramolecular hydrogen bond is present [MP PET 1994]
(a) Ethyl alcohol (b) Water
(c) Salicylaldehyde (d) Hydrogen sulphide
31. Hydrogen bonding is formed in compounds containing hydrogen and [MP PET 1995]
(a) Highly electronegative atoms
(b) Highly electropositive atoms
(c) Metal atoms with d -orbitals occupied
(d) Metalloids
32. Which of the following compounds in liquid state does not have hydrogen bonding [MP PMT 1996]
(a) H_2O (b) HF
(c) NH_3 (d) C_6H_6
33. Compounds showing hydrogen bonding among HF , NH_3 , H_2S and PH_3 are
(a) Only HF , NH_3 and PH_3

- (b) Only HF and NH_3
 (c) Only NH_3 , H_2S and PH_3
 (d) All the four
34. The high density of water compared to ice is due to
 [CBSE PMT 1997; BHU 1999; AFMC 2001]
 (a) Hydrogen bonding interactions
 (b) Dipole-dipole interactions
 (c) Dipole-induced dipole interactions
 (d) Induced dipole-induced dipole interactions
35. Ethanol and dimethyl ether form a pair of functional isomers. The boiling point of ethanol is higher than that of dimethyl ether due to the presence of [AIIMS 1998]
 (a) Hydrogen bonding in ethanol
 (b) Hydrogen bonding in dimethyl ether
 (c) CH_3 group in ethanol
 (d) CH_3 group in dimethyl ether
36. Which of the following hydrogen bonds are strongest in vapour phase [AMU 1999]
 (a) $HF \cdots HF$ (b) $HF \cdots HCl$
 (c) $HCl \cdots HCl$ (d) $HF \cdots HI$
37. Which of the following shows hydrogen bonding [CPMT 2000]
 (a) NH_3 (b) P
 (c) As (d) Sb
38. The boiling point of a compound is raised by [DPMT 2001]
 (a) Intramolecular hydrogen bonding
 (b) Intermolecular hydrogen bonding
 (c) Covalent bonding
 (d) Ionic covalent
39. The boiling point of water is exceptionally high because [KCET 2001]
 (a) Water molecule is linear
 (b) Water molecule is not linear
 (c) There is covalent bond between H and O
 (d) Water molecules associate due to hydrogen bonding
40. NH_3 has a much higher boiling point than PH_3 because [UPSEAT 2002; MNR 1994]
 (a) NH_3 has a larger molecular weight
 (b) NH_3 undergoes umbrella inversion
 (c) NH_3 forms hydrogen bond
 (d) NH_3 contains ionic bonds whereas PH_3 contains covalent bonds
41. Which one has the highest boiling point [MP PET 2002]
 (a) Acetone (b) Ethyl alcohol
 (c) Diethyl ether (d) Chloroform
42. Which of the following compounds has the highest boiling point [JIPMER 2002]
 (a) HCl (b) HBr
 (c) H_2SO_4 (d) HNO_3
43. Which of the following has minimum melting point [UPSEAT 2003]
 (a) CsF (b) HCl
 (c) HF (d) LiF
44. Hydrogen bond energy is equal to [UPSEAT 2003]
 (a) 3 – 7 cal (b) 30 – 70 cal
 (c) 3 – 10 kcal (d) 30 – 70 kcal
45. H_2O is a liquid while H_2S is gas due to [BHU 2003]
 (a) Covalent bonding
 (b) Molecular attraction
 (c) H – bonding
 (d) H – bonding and molecular attraction
46. H – bonding is maximum in [BHU 2003]
 (a) C_6H_5OH (b) C_6H_5COOH
 (c) CH_3CH_2OH (d) CH_3COCH_3
47. Select the compound from the following which dissolves in water [IIT 1980]
 (a) CCl_4 (b) CS_2
 (c) $CHCl_3$ (d) C_2H_5OH
48. When two ice cubes are pressed over each other, they unit to form one cube. Which of the following force is responsible for holding them together [NCERT 1978]
 (a) Vander Waal's forces
 (b) Hydrogen bond formation
 (c) Covalent attraction
 (d) Dipole-dipole attraction
49. Which is the weakest among the following types of bond [NCERT 1979; MADT Bihar 1984]

- (a) Ionic bond (b) Metallic bond
(c) Covalent bond (d) Hydrogen bond
50. H-bond is not present in [BCECE 2005]
(a) Water (b) Glycerol
(c) Hydrogen fluoride (d) Hydrogen Sulphide

Types of bonding and Forces in solid

1. In a crystal cations and anions are held together by [EAMCET 1982]
(a) Electrons (b) Electrostatic forces
(c) Nuclear forces (d) Covalent bonds
2. In the following metals which one has lowest probable interatomic forces [MP PMT 1990]
(a) Copper (b) Silver
(c) Zinc (d) Mercury
3. In solid argon, the atoms are held together by [NCERT 1981; MP PET 1995]
(a) Ionic bonds (b) Hydrogen bonds
(c) Vander Waals forces (d) Hydrophobic forces
4. Which one is the highest melting halide [AIIMS 1980]
(a) NaCl (b) NaBr
(c) NaF (d) NaI
5. The enhanced force of cohesion in metals is due to [NCERT 1972]
(a) The covalent linkages between atoms
(b) The electrovalent linkages between atoms
(c) The lack of exchange of valency electrons
(d) The exchange energy of mobile electrons
6. Which one of the following substances consists of small discrete molecules [CPMT 1987]
(a) NaCl (b) Graphite
(c) Copper (d) Dry ice
7. Which of the following does not apply to metallic bond [CBSE PMT 1989]
(a) Overlapping valency orbitals
(b) Mobile valency electrons
(c) Delocalized electrons
(d) Highly directed bonds
8. In melting lattice, structure of solid [CPMT 1982]
(a) Remains unchanged (b) Changes
(c) Becomes compact (d) None of the above
9. Which of the following has the highest melting point

[CPMT 1994]

- (a) Pb (b) Diamond
(c) Fe (d) Na
10. In the formation of a molecule by an atom [AFMC 1995]
(a) Attractive forces operate
(b) Repulsive forces operate
(c) Both attractive and repulsive forces operate
(d) None of these
11. Which has weakest bond [RPMT 1997]
(a) Diamond (b) Neon (Solid)
(c) KCl (d) Ice
12. Which of the following exhibits the weakest intermolecular forces [AIIMS 1999; BHU 2000]
(a) He (b) HCl
(c) NH₃ (d) H₂O
13. Glycerol has strong intermolecular bonding therefore it is [RPET 2000]
(a) Sweet (b) Reactive
(c) Explosive (d) Viscous
14. Among the following the weakest one is [Pb. PMT 2004; CPMT 2002]
(a) Metallic bond (b) Ionic bond
(c) Van der Waal's force (d) Covalent bond
15. Lattice energy of alkali metal chlorides follows the order [DPMT 2004]
(a) LiCl > NaCl > KCl > RbCl > CsCl
(b) CsCl > NaCl > KCl > RbCl > LiCl
(c) LiCl > CsCl > NaCl > KCl > RbCl
(d) NaCl > LiCl > KCl > RbCl > CsCl
16. In the following which molecule or ion possesses electrovalent, covalent and co-ordinate bond at the same time [CPMT 1987]
(a) HCl (b) NH₄⁺
(c) Cl⁻ (d) H₂O₂
17. Both ionic and covalent bond is present in the following [MNR 1986; MP PMT 2004]
(a) CH₄ (b) KCl
(c) SO₂ (d) NaOH
18. The formation of a chemical bond is accompanied by

[MP PET 1995]

- (a) Decrease in energy
- (b) Increase in energy
- (c) Neither increase nor decrease in energy
- (d) None of these

19. Chemical bond implies

[KCET 2002]

- (a) Attraction
- (b) Repulsion
- (c) Neither attraction nor repulsion
- (d) Both (a) and (b)

20. Which of the following statements is true [AIEEE 2002]

- (a) HF is less polar than HBr
- (b) Absolutely pure water does not contain any ions
- (c) Chemical bond formation take place when forces of attraction overcome the forces of repulsion
- (d) In covalency transference of electron takes place

21. Which of the following statements is true about $[Cu(NH_3)_4]SO_4$ [CPMT 1988]

- (a) It has coordinate and covalent bonds
- (b) It has only coordinate bonds
- (c) It has only electrovalent bonds
- (d) It has electrovalent, covalent and coordinate bonds

22. Blue vitriol has

- (a) Ionic bond
- (b) Coordinate bond
- (c) Hydrogen bond
- (d) All the above

23. The number of ionic, covalent and coordinate bonds in NH_4Cl are respectively [MP PMT 1999]

- (a) 1, 3 and 1
- (b) 1, 3 and 2
- (c) 1, 2 and 3
- (d) 1, 1 and 3

24. Covalent molecules are usually held in a crystal structure by

[MP PET 1995]

- (a) Dipole-dipole attraction
- (b) Electrostatic attraction
- (c) Hydrogen bonds
- (d) Vander Waal's attraction

1. The values of electronegativity of atoms A and B are 1.20 and 4.0 respectively. The percentage of ionic character of $A - B$ bond is

[MP PET 2003]

- (a) 50 %
- (b) 43 %
- (c) 55.3 %
- (d) 72.24 %

2. O_2^{2-} is the symbol of ion

[EAMCET 2003]

- (a) Oxide
- (b) Superoxide
- (c) Peroxide
- (d) Monoxide

3. The number of electrons that are paired in oxygen molecule is

[IIT 1995]

- (a) 7
- (b) 8
- (c) 14
- (d) 16

4. When N_2 goes to N_2^+ , the $N - N$ bond distance and when O_2 goes to O_2^+ , the $O - O$ bond distance

[IIT 1996]

- (a) Decrease, increase
- (b) Increase, decrease
- (c) Increase, increase
- (d) None of these

5. Which of the following contains a coordinate covalent bond

[UPSEAT 2001]

- (a) $N_2H_5^+$
- (b) $BaCl_2$
- (c) HCl
- (d) H_2O

6. Which combination is best explained by the coordinate covalent bond [JIPMER 2001; CBSE PMT 1990]

- (a) $H^+ + H_2O$
- (b) $Cl + Cl$
- (c) $Mg + \frac{1}{2}O_2$
- (d) $H_2 + I_2$

7. Arrange the following compounds in order of increasing dipole moment.

- (I) Toluene
- (II) m -dichlorobenzene
- (III) o -dichlorobenzene
- (IV) p -dichlorobenzene

[IIT 1996]

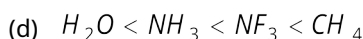
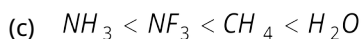
- (a) $I < IV < II < III$
- (b) $IV < I < II < III$
- (c) $IV < I < III < II$
- (d) $IV < II < I < III$

8. The correct order of dipole moment is [Roorkee 1999]

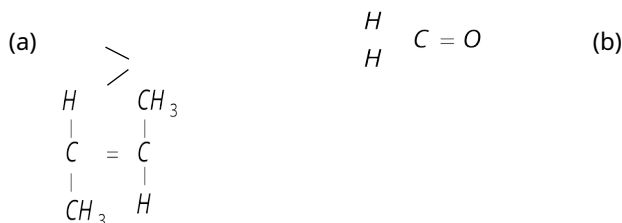
- (a) $CH_4 < NF_3 < NH_3 < H_2O$
- (b) $NF_3 < CH_4 < NH_3 < H_2O$

Critical Thinking

Objective Questions



9. Which of the following has the highest dipole moment [AIIMS 2002]



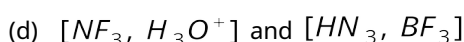
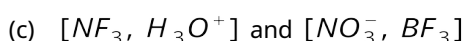
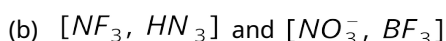
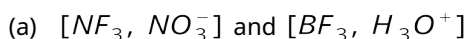
10. Which of the following arrangement of molecules is correct on the basis of their dipole moments [AIIMS 2002]



11. The type of hybrid orbitals used by the chlorine atom in ClO_2^- is [IIT 1992]



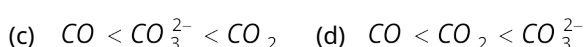
12. Among the following species, identify the isostructural pairs, NF_3 , NO_3^- , BF_3 , H_3O^+ , HN_3 [IIT 1996]



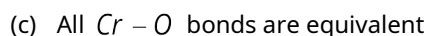
13. In the compound $CH_2=CH-CH_2-CH_2-C\equiv CH$, the C_2-C_3 bond is of the type [IIT 1999]



14. The correct order of increasing $C-O$ bond length of CO , CO_3^{2-} , CO_2 is [IIT 1999]



15. In the dichromate dianion [IIT 1999]



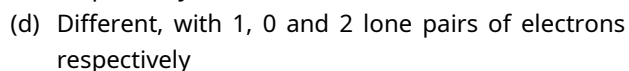
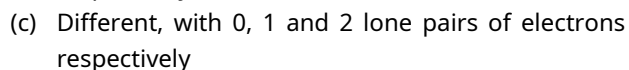
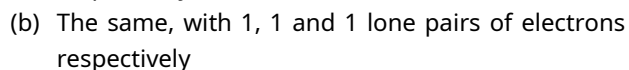
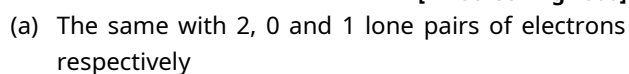
16. Bond length of ethane (I), ethene (II), acetylene (III) and benzene (IV) follows the order [CPMT 1999]



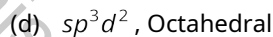
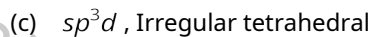
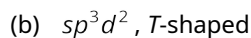
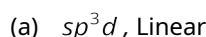
17. Hybridisation state of chlorine in ClF_3 is [RPET 1999]



18. Molecular shapes of SF_4 , CF_4 and XeF_4 are [IIT Screening 2000]



19. Structure of IF_4^+ and hybridization of iodine in this structure are [UPSEAT 2001]



20. In which of the following the central atom does not use sp^3 hybrid orbitals in its bonding [UPSEAT 2001, 02]



21. The magnetic moment of $K_3[Fe(CN)_6]$ is found to be 1.7 B.M. How many unpaired electron (s) is/are present per molecule [Orissa JEE 2003]



22. N_2 and O_2 are converted into monocations N_2^+ and O_2^+ respectively. Which is wrong [CBSE PMT 1997]



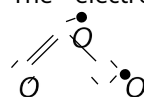
23. The common features among the species CN^- , CO and NO^+ are [IIT Screening 2001]

- (a) Bond order three and isoelectronic
 (b) Bond order three and weak field ligands
 (c) Bond order two and π -acceptors
 (d) Isoelectronic and weak field ligands
24. The number of S – S bonds in sulphur trioxide trimer S_3O_9 is [IIT Screening 2001]
 (a) Three (b) Two
 (c) One (d) Zero
25. Strongest intermolecular hydrogen bond is present in the following molecules pairs [IIT 1981; DCE 2000]
 (a) SiH_4 and SiF_4
 (b) $CH_3 - \overset{\overset{O}{||}}{C} - CH_3$ and $CHCl_3$
 (c) $H - \overset{\overset{O}{||}}{C} - OH$ and $CH_3 - \overset{\overset{O}{||}}{C} - OH$
 (d) H_2O and H_2O_2
26. A compound contains atoms X, Y, Z. The oxidation number of X is +2, Y is +5 and Z is -2. Therefore, a possible formula of the compound is [CPMT 1988]
 (a) XYZ_2 (b) $X_2(YZ_3)_2$
 (c) $X_3(YZ_4)_2$ (d) $X_3(Y_4Z)_2$
27. Bonds present in $CuSO_4 \cdot 5H_2O$ is [IIT 1983; DCE 2001]
 (a) Electrovalent and covalent
 (b) Electrovalent and coordinate
 (c) Electrovalent, covalent and coordinate
 (d) Covalent and coordinate
28. The ionization of hydrogen atom would give rise to [UPSEAT 2001]
 (a) Hybrid ion (b) Hydronium ion
 (c) Proton (d) Hydroxyl ion
29. Which can be described as a molecule with residual bonding capacity [JIPMER 2000]
 (a) $BeCl_2$ (b) $NaCl$
 (c) CH_4 (d) N_2

Read the assertion and reason carefully to mark the correct option out of the options given below :

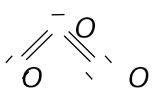
- (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.
 (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
 (c) If assertion is true but reason is false.
 (d) If the assertion and reason both are false.
 (e) If assertion is false but reason is true.

1. Assertion : Water is a good solvent for ionic compounds but poor one for covalent compounds.
 Reason : Hydration energy of ions releases sufficient energy to overcome lattice energy and break hydrogen bonds in water, while covalent bonded compounds interact so weakly that even Vander Wall's forces between molecules of covalent compounds cannot be broken. [AIIMS 1996]
2. Assertion : The atoms in a covalent molecule are said to share electrons, yet some covalent molecules are polar.
 Reason : In a polar covalent molecule, the shared electrons spend more time on the average near one of the atoms. [AIIMS 1996]
3. Assertion : Diborane is electron deficient
 Reason : There are no enough valence electrons to form the expected number of covalent bonds [AIIMS 2001]
4. Assertion : A resonance hybrid is always more stable than any of its canonical structures
 Reason : This stability is due to delocalization of electrons [AIIMS 1999]
5. Assertion : All $F - S - F$ angle in SF_4 greater than 90° but less than 180°
 Reason : The lone pair-bond pair repulsion is weaker than bond pair-bond pair repulsion [AIIMS 2004]
6. Assertion : The electronic structure of O_3 is



Assertion & Reason

For AIIMS Aspirants

Reason :  structure is not allowed because octet around cannot be expanded.

[IIT 1998]

7. Assertion : Bond order can assume any value number including zero

Reason : Higher the bond order, shorter is bond length and greater is bond energy

[AIIMS 1999]

8. Assertion : Ortho nitrophenol molecules are associated due to the presence of intermolecular hydrogen bonding while paranitrophenol involves intramolecular, hydrogen bonding

Reason : Ortho nitrophenol is more volatile than the para nitrophenol [AIIMS 1999]

9. Assertion : Nitrogen molecule diamagnetic.

Reason : N_2 molecule have unpaired electrons.

10. Assertion : Ice is less dense than liquid water.

Reason : There are vacant spaces between hydrogen bonded water molecules in ice.

11. Assertion : Water is liquid but H_2S is a gas.

Reason : Oxygen is paramagnetic.

12. Assertion : Iodine is more soluble in water than in carbon tetrachloride.

Reason : Iodine is a polar compound.

13. Assertion : *o* and *p*-nitrophenols can be separated by steam distillation.

Reason : *o*-nitrophenol have intramolecular hydrogen bonding while *p*-nitrophenol exists as associated molecules.

14. Assertion : The fluorine has lower reactivity.

Reason : $F-F$ bond has low bond dissociation energy.

15. Assertion : σ is strong while π is a weak bond.

Reason : Atoms rotate freely about π bond.

16. Assertion : The crystal structure gets stabilized even though the sum of electron gain enthalpy and ionization enthalpy is positive.

Reason : Energy is absorbed during the formation of crystal lattice.

17. Assertion : Order of lattice energy for same halides are as $LiX > NaX > KX$.

Reason : Size of alkaline – earth metal increases from *Li* to *K*.

18. Assertion : Born-Haber cycle is based on Hess's law.

Reason : Lattice enthalpy can be calculated by Born- Haber cycle.

19. Assertion : Bond energy has order like $C-C < C=C < C\equiv C$.

Reason : Bond energy increases with increase in bond order.

20. Assertion : Electron affinity refers to an isolated atom's attraction for an additional electron while electronegativity is the ability of an element to attract electrons towards itself in a shared pair of electrons.

Reason : Electron affinity is a relative number and electronegativity is experimentally measurable.

21. Assertion : Geometry of SF_4 molecule can be termed as distorted tetrahedron, a folded square or see saw.

Reason : Four fluorine atoms surround or form bond with sulphur molecule.

22. Assertion : BF_3 has greater dipole moment than H_2S .

Reason : Fluorine is more electronegative than sulphur.

23. Assertion : The bond between two identical nonmetal atoms has a pair of electrons with identical spin.

Reason : Electrons are transferred fully from one atom to another.

24. Assertion : B_2 molecule is diamagnetic.

Reason : The highest occupied molecular orbital is of σ type. [AIIMS 2005]

25. Assertion : The nearly tetrahedral arrangement of the orbitals about the oxygen atom allows each water molecule to form hydrogen bonds with as many as four neighbouring water molecules.

Reason : In ice each molecule forms four hydrogen bonds as each molecule is fixed in the space.

26. Assertion : The bond order of helium is always zero.

Reason : The number of electrons in bonding molecular orbital and antibonding molecular orbital is equal.

Answers

Electrovalent bonding

1	b	2	a	3	a	4	c	5	c
6	d	7	d	8	b	9	c	10	d
11	b	12	a	13	d	14	a	15	a
16	c	17	b	18	a	19	d	20	c
21	b	22	d	23	a	24	a	25	b
26	d	27	d	28	c	29	a	30	d
31	b	32	b	33	b	34	d	35	b
36	a	37	b	38	a	39	a	40	c
41	c	42	b	43	d	44	b	45	c
46	c	47	a	48	b	49	c	50	b
51	b	52	b	53	a	54	a	55	a
56	c	57	a	58	c	59	a	60	c
61	a	62	b	63	d	64	d	65	b
66	a	67	abc	68	bd				

Covalent bonding

1	c	2	c	3	B	4	b	5	d
6	a	7	c	8	a	9	d	10	a
11	b	12	b	13	c	14	b	15	c
16	a	17	a	18	c	19	a	20	b
21	a	22	a	23	c	24	c	25	c
26	c	27	a	28	a	29	a	30	d
31	b	32	a	33	d	34	a	35	d
36	b	37	d	38	c	39	d	40	c
41	b	42	b	43	b	44	b	45	b
46	d	47	d	48	b	49	a	50	a
51	b	52	d	53	c	54	d	55	d
56	d	57	a	58	a	59	d	60	a
61	c	62	a	63	b	64	b	65	b
66	b	67	b	68	d	69	b	70	c
71	c	72	c	73	cd	74	ad	75	ab
76	a								

Co-ordinate or Dative bonding

1	d	2	b	3	c	4	d	5	c
6	b	7	a	8	d	9	a	10	d
11	c	12	a	13	a	14	b	15	c

Dipole moment

1	b	2	d	3	d	4	a	5	c
6	c	7	a	8	a	9	c	10	b
11	b	12	d	13	b	14	c	15	d
16	c	17	c	18	a	19	c	20	b
21	d	22	b	23	b	24	b	25	a
26	b	27	b	28	b	29	c	30	a
31	a	32	c	33	a	34	bd	35	a

Polarisation and Fajan's rule

1	d	2	c	3	b	4	d	5	c
6	a	7	b	8	a	9	c	10	b
11	d	12	c	13	b	14	b	15	d
16	d	17	c	18	b	19	a	20	d
21	a	22	c	23	d	24	a	25	b
26	b								

Overlapping - σ and π - bonds

1	c	2	c	3	b	4	b	5	c
6	c	7	c	8	b	9	d	10	c
11	b	12	c	13	a	14	a	15	d
16	a	17	d	18	c	19	d	20	d

Hybridisation

1	d	2	d	3	d	4	c	5	d
6	a	7	c	8	b	9	d	10	d
11	d	12	a	13	a	14	b	15	a
16	b	17	c	18	a	19	d	20	b
21	c	22	c	23	a	24	c	25	a
26	a	27	b	28	c	29	b	30	a
31	d	32	a	33	d	34	c	35	c
36	b	37	b	38	c	39	b	40	b
41	d	42	b	43	c	44	a	45	c
46	c	47	d	48	b	49	c	50	a
51	b	52	a	53	c	54	c	55	c
56	d	57	b	58	a	59	b	60	c
61	b	62	c	63	b	64	b	65	b
66	a	67	c	68	b	69	c	70	a

71	a	72	a	73	b	74	b	75	d
76	d	77	c	78	a	79	d	80	b
81	c	82	b	83	d	84	a	85	d
86	b	87	d	88	c	89	a	90	c
91	c	92	c	93	a	94	b	95	c
96	a	97	b	98	b	99	b	100	b
101	a	102	b	103	d	104	a	105	b
106	a	107	a	108	b	109	b	110	a
111	a	112	b	113	b	114	d	115	d
116	c	117	c	118	b	119	c	120	a
121	a	122	c	123	a	124	a	125	b
126	c	127	d	128	c	129	c	130	a
131	b	132	b	133	e	134	c	135	d
136	b	137	b	138	d	139	a	140	a
141	a	142	b	143	a	144	a	145	a
146	b	147	c	148	d	149	bcd	150	a
151	ac	152	a						

Resonance

1	d	2	b	3	b	4	b	5	b
6	c	7	a	8	c	9	b	10	c
11	abcd								

VSEPR Theory

1	a	2	a	3	b	4	c	5	c
6	b	7	b	8	c	9	b	10	a
11	c	12	a	13	a	14	a	15	c
16	c	17	b	18	d	19	d	20	a
21	a	22	d	23	b	24	d	25	a
26	c	27	b	28	b	29	a	30	a
31	a	32	c	33	c	34	a	35	c
36	b	37	b	38	d	39	d	40	b
41	c	42	a	43	b	44	c	45	d

Molecular orbital theory

1	a	2	c	3	b	4	b	5	c
6	d	7	c	8	b	9	c	10	b
11	c	12	b	13	c	14	a	15	c
16	c	17	d	18	b	19	c	20	c
21	d	22	c	23	b	24	c	25	a
26	d	27	b	28	b	29	a	30	c

31	c	32	a	33	c	34	a	35	c
36	d	37	b	38	a	39	a	40	c
41	c	42	a	43	b	44	a	45	a
46	c	47	b	48	c	49	c	50	a
51	c	52	b	53	a	54	a	55	a
56	c	57	c	58	c	59	a	60	a
61	a	62	b	63	a	64	c	65	a
66	c	67	a	68	a	69	c	70	a
71	b	72	b	73	d	74	c	75	a
76	b	77	b	78	a	79	c	80	a
81	c	82	a	83	c	84	d		

Hydrogen bonding

1	d	2	b	3	b	4	a	5	c
6	d	7	b	8	d	9	c	10	c
11	d	12	b	13	a	14	b	15	d
16	d	17	b	18	d	19	c	20	c
21	a	22	a	23	d	24	a	25	c
26	a	27	b	28	c	29	a	30	c
31	a	32	b	33	d	34	a	35	a
36	a	37	a	38	b	39	d	40	c
41	a	42	c	43	b	44	c	45	c
46	b	47	d	48	b	49	d	50	d

Types of bonding and Forces in solid

1	b	2	d	3	c	4	c	5	d
6	d	7	d	8	b	9	b	10	c
11	d	12	a	13	d	14	c	15	a
16	b	17	d	18	a	19	d	20	c
21	d	22	d	23	a	24	d		

Critical Thinking Question

1	d	2	c	3	c	4	b	5	a
6	a	7	b	8	a	9	a	10	d
11	a	12	c	13	d	14	d	15	b
16	c	17	b	18	d	19	c	20	a
21	a	22	d	23	a	24	d	25	c
26	c	27	c	28	c	29	a		

Assertion & Reason

1	a	2	a	3	a	4	a	5	c
6	b	7	b	8	e	9	c	10	a

11	b	12	d	13	a	14	e	15	c
16	c	17	c	18	b	19	a	20	c
21	b	22	e	23	d	24	d	25	a
26	a								

Telegram @Chemistry_Spark

Level - 1
BONDING AND MOLECULAR STRUCTURE
Multiple Choice Question

Telegram @Chemistry_Spark

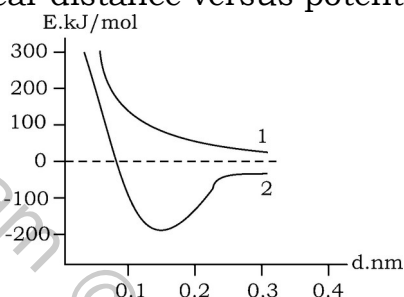
-
1. If molecule MX_3 has zero dipole moment, the sigma bonding orbitals used by M (atomic number < 21) are
(a) pure p (b) sp hybrid (c) sp^2 hybrid (d) sp^3 hybrid.
 2. The types of bonds present in $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ are only
(a) electrovalent and covalent
(b) electrovalent and co-ordinate
(c) electrovalent, covalent and co-ordinate covalent
(d) covalent and co-ordinate co-valent
 3. In $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$, Cu has the following hybridisation
(a) dsp^2 (b) sp^3 (c) sp^2 (d) sp^3d^2 .
 4. H_2O has a net dipole moment while BeF_2 has zero dipole moment because
(a) H_2O molecules is linear while BeF_2 is bent
(b) BeF_2 molecule is linear while H_2O is bent
(c) Fluorine has more electro- negativity than oxygen
(d) Beryllium has more electro negativity than oxygen
 5. The molecule which has zero dipole moment is
(a) CH_2Cl_2 (b) BF_3 (c) NF_3 (d) ClO_2
 6. Among LiCl , BeCl_2 , BCl_3 and CCl_4 , the covalent bond character follows the order
(a) $\text{LiCl} < \text{BeCl}_2 > \text{BCl}_3 > \text{CCl}_4$ (b) $\text{LiCl} > \text{BeCl}_2 < \text{BCl}_3 < \text{CCl}_4$
(c) $\text{LiCl} < \text{BeCl}_2 < \text{BCl}_3 < \text{CCl}_4$ (d) $\text{LiCl} > \text{BeCl}_2 > \text{BCl}_3 > \text{CCl}_4$
 7. The percentage of s-character in the hybrid orbitals sp , sp^2 and sp^3 follows the pattern.
(a) $\text{sp}^3 > \text{sp}^2 > \text{sp}$ (b) $\text{sp} > \text{sp}^2 > \text{sp}^3$
(c) $\text{sp} = \text{sp}^2 > \text{sp}^3$ (d) $\text{sp} = \text{sp}^2 = \text{sp}^3$
 8. Amongst LiCl , RbCl , BeCl_2 and MgCl_2 , the compounds with the greatest and the least ionic character respectively are
(a) LiCl and RbCl (b) RbCl and BeCl_2
(c) RbCl and MgCl_2 (d) MgCl_2 and BeCl_2
 9. Which of the following has a bond formed by the overlap of sp-sp^3 hybrid orbitals?
(a) $\text{CH}_3 - \text{C} \equiv \text{C} - \text{H}$ (b) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_3$
(c) $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$ (d) $\text{HC} \equiv \text{CH}$.
 10. Which of the following has zero dipole moment?
(a) ClF (b) PCl_3 (c) SiF_4 (d) CFCl_3
 11. The dielectric constant of H_2O is 80. The electrostatic force of attraction between Na^+ and Cl^- will be
-

-
- (a) reduced to $1/40$ in water than in air
(b) reduced to $1/80$ in water than in air
(c) will be increased to 80 in water than in air
(d) will remain unchanged
12. The distance between the two adjacent carbon atoms is largest in
(a) Benzene (b) Ethene (c) Butane (d) Ethyne
13. Which concept best explains the fact that o-nitrophenol is more volatile than p-nitrophenol ?
(a) resonance (b) hyperconjugation
(c) hydrogen bonding (d) steric hindrance
14. KF combines with HF to form KHF_2 . The compound contains the species
(a) K^+ , F^- and H^+ (b) K^+ , F^- and HF (c) K^+ and $[\text{HF}_2]^-$ (d) $[\text{KHF}]^+$ and F_2
15. N_2 and O_2 are converted into monocations, N_2^+ and O_2^+ respectively. Which of the following is wrong ?
(a) In N_2^+ , N-N bond weakens (b) In O_2^+ , the O-O bond order increase
(c) In O_2^+ , paramagnetism decreases (d) N_2^+ becomes diamagnetic.
16. The high density of water compared to ice is due to
(a) H-bonding interaction (b) dipole-dipole interactions
(c) dipole-induced dipole interactions (d) induced dipole-induced dipole interactions
17. An element (X) forms compounds of the formula XCl_3 , X_2O_5 and Ca_3X_2 but does not form XCl_5 . Which of the following is the element X ?
(a) B (b) Al (c) N (d) P
18. The hybridization of S atom in SO_2 is
(a) sp (b) sp^2 (c) sp^3 (d) sp^3d .
19. The metallic lustre exhibited by sodium is explained by
(a) diffusion of sodium ions (b) excitation of free protons
(c) oscillation of loose electrons (d) existence of body centred cubic lattice.
20. The hydrogen bond is strongest in
(a) $\text{F}-\text{H}\cdots\text{O}$ (b) $\text{F}-\text{H}\cdots\text{F}$ (c) $\text{O}-\text{H}\cdots\text{S}$ (d) $\text{O}-\text{H}\cdots\text{N}$
21. The correct order of increasing C-O bond length of CO, CO_3^{2-} , CO_2 is
(a) $\text{CO}_3^{2-} < \text{CO}_2 < \text{CO}$ (b) $\text{CO}_2 < \text{CO}_3^{2-} < \text{CO}$
(c) $\text{CO} < \text{CO}_3^{2-} < \text{CO}_2$ (d) $\text{CO} < \text{CO}_2 < \text{CO}_3^{2-}$
-

-
22. The hybridization of atomic orbitals of nitrogen in NO_2^+ , NO_3^- and NH_4^+ are
(a) sp^2 , sp^3 and sp^2 respectively (b) sp , sp^2 and sp^3 respectively
(c) sp^2 , sp and sp^3 respectively (d) sp^2 , sp^3 and sp respectively
23. The number of antibonding electron pairs in O_2^{2-} molecular ion on the basis of molecular orbital theory is (at. no. O = 8)
(a) 2 (b) 3 (c) 4 (d) 5.
24. Among the following, electron deficient compound is
(a) CCl_4 (b) PCl_5 (c) SF_2 (d) BCl_3
25. Among H_2O , H_2S , H_2Se and H_2Te , the one with the highest boiling point is
(a) H_2O because of hydrogen bonding
(b) H_2Te because of higher molecular weight
(c) H_2S because of hydrogen bonding
(d) H_2Se because of lower molecular weight.
26. The common features among the species CN^- , CO and NO^+ are
(a) bond order three and isoelectronic
(b) bond order three and weak field ligands
(c) Bond order two and π -acceptors
(d) Isoelectronic and weak field ligands.
27. Which of the following molecular species has unpaired electron (s) ?
(a) N_2 (b) F_2 (c) O_2^- (d) O_2^{2-} .
28. The nodal plane in the π -bond of ethene is located in
(a) the molecular plane (b) a plane parallel to the molecular plane
(c) a plane perpendicular to the molecular plane which bisects the carbon – carbon sigma bond at right angle
(d) a plane perpendicular to the molecular plane which contains the carbon-carbon σ -bond.
29. Paramagnetism of oxygen is explained on the basis of its electronic configuration of
(a) $(2\pi_x^*)^1 (2\pi_y)^1$ (b) $(2\pi_x^*)^1 (2p_y^*)^1$ (c) $(2\sigma_s^*)^1 (2\pi_y)^1$ (d) $(2\sigma_s)^1 (2\pi_y)^1$
30. If Z-axis is taken as the molecular axis, then π orbitals are formed by
(a) $2p_x$ and $2p_z$ (b) $2p_x$ and $2p_y$ (c) $2s$ and $2p_y$ (d) $2s$ and $2p_z$
31. The cyanide ion, CN^- and N_2 are isoelectronic. But in contrast to CN^- , N_2 is chemically inert, because of
(a) low bond energy (b) absence of bond polarity
(c) unsymmetrical electron distribution
-

(d) presence of more number of electrons in bonding orbitals.

32. A diatomic molecule has a dipole moment of 1.2 D. If the bond distance is 1 Å, what percentage of electronic charge exists on each atom?
 (a) 12% of e (b) 19% of e (c) 25% of e (d) 29% of e
33. AlCl_3 is covalent while AlF_3 is ionic. This fact can be justified on the basis of
 (a) Valence bond theory (b) Crystal structure
 (c) Lattice energy (d) Fajan Rule
34. Consider the given figure showing that possible levels of the energy of H_2^+ ion depending on internuclear distance versus potential energy of the system .



It may be easily assumed that the ground state of the molecular hydrogen ion, H_2^+ corresponds to the lowest level which means that

- (a) Curve 1 represents the most stable state of the system for H_2^+ ion
 (b) Curve 2 represent the most stable state of the system for H_2^+ ion
 (c) Curve 1 indicates that the molecular hydrogen ion is formed
 (d) Curve 2 represents the energy level of the antibonding region.
35. **Match List I (species) with List II (Hybrid orbitals used by the central atom in their formation) and select the correct answer:**

List I	A. MnCl_5^{3-}	B. CuCl_5^{3-}	C. AuCl_4^-	D. ClO_4^-
List II	1. sp^3	2. dsp^2	3. $\text{sp}^3 \text{d}_z^2$	4. $\text{d}_x^2\text{-y}^2\text{sp}^3$

	A	B	C	D
(a)	1	3	2	4
(b)	3	4	2	1
(c)	4	2	1	3
(d)	4	3	2	1

Level – 2
More than one option is correct.

1. Most ionic compounds have
 - (a) high melting points and low boiling points
 - (b) high melting points and nondirectional bonds
 - (c) high solubilities in polar solvents and low solubilities in nonpolar solvents
 - (d) three - dimensional network structures, and are good conductors of electricity in the molten state
 2. Which of the following substances are expected to be covalent?
 - (a) BeCl_2
 - (b) SnCl_4
 - (c) ZnS
 - (d) ZnCl_2
 3. Which of the following have a three - dimensional network structure ?
 - (a) SiO_2
 - (b) $(\text{BN})_x$
 - (c) P_4 (white)
 - (d) CCl_4
 4. To which of the following species is the octet rule not applicable?
 - (a) BrF_5
 - (b) SF_6
 - (c) IF_7
 - (d) CO
 5. Which of the following do not exist?
 - (a) SH_6
 - (b) HFO_4
 - (c) FeI_3
 - (d) HClO_3
 6. The species which contain an odd number of valence electrons and are paramagnetic are
 - (a) NO
 - (b) NO_2
 - (c) ClO_2
 - (d) N_2O_4
 7. Among the following, the elements which show inert-pair effect are
 - (a) Bi
 - (b) Sn
 - (c) Pb
 - (d) C
 8. Which of the following, have an $(18 + 2)$ -electron configuration?
 - (a) Pb^{2+}
 - (b) Cd^{2+}
 - (c) Bi^{3+}
 - (d) SO_4^{2-}
 9. Which of the following species contain covalent coordinate bonds?
 - (a) AlCl_3
 - (b) CO
 - (c) $[\text{Fe}(\text{CN})_6]^{4-}$
 - (d) N_3^-
 10. Which of the following oxyacids of Sulphur contain S-S bonds?
 - (a) $\text{H}_2\text{S}_2\text{O}_8$
 - (b) $\text{H}_2\text{S}_2\text{O}_6$
 - (c) $\text{H}_2\text{S}_2\text{O}_4$
 - (d) H_2SO_5
 11. Which of the following factors are responsible for van der Waals forces?
 - (a) Instantaneous dipole-induced dipole interaction
 - (b) Dipole-induced dipole interaction and ion-induced dipole interaction
 - (c) Dipole-dipole interaction and ion-induced dipole interaction
 - (d) Small size of molecule
-

-
12. Which of the following are true?
- (a) Van der Waals forces are responsible for the formation of molecular crystals.
 - (b) Branching lowers the boiling points of isomeric organic compounds due to van der Waals forces of attraction
 - (c) In graphite, van der Waals forces act between the carbon layers.
 - (d) In diamond, van der Waals forces act between the carbon layers.
13. Which of the following statements are correct?
- (a) The crystal lattice of ice is mostly formed by covalent as well as hydrogen bonds.
 - (b) The density of water increases when heated from 0°C to 4°C due to the change in the structure of the cluster of water molecules.
 - (c) Above 4°C the thermal agitation of water molecules increases. Therefore, intermolecular distance increases and water starts expanding.
 - (d) The density of water increases from 0°C to a maximum at 4°C because the entropy of the system increases.
14. Intermolecular hydrogen bonding increases the enthalpy of vaporization of a liquid due to the
- (a) decrease in the attraction between molecules
 - (b) increase in the attraction between molecules
 - (c) decrease in the molar mass of unassociated liquid molecules
 - (d) increase in the effective molar mass of hydrogen-bonded molecules
15. Which of the following molecules have intermolecular hydrogen bonds?
- (a) KH_2PO_4 (b) H_3BO_3 (c) $\text{C}_6\text{H}_5\text{CO}_2\text{H}$ (d) CH_3OH
16. Intramolecular hydrogen bonds occur in
- (a) 2-chlorophenol (b) salicylic acid
(c) the enol form of acetylacetone (d) paranitrophenol
17. Which of the following are diamagnetic?
- (a) C_2 (b) O_2^{2-} (c) Li_2 (d) N_2^+
18. Which of the following are paramagnetic?
- (a) B_2 (b) O_2 (c) N_2 (d) He_2
19. Which of the following species have a bond order of 3?
- (a) CO (b) CN^- (c) NO^+ (d) O_2^+
20. Among the following, the species with one unpaired electron are
- (a) O_2^+ (b) NO (c) O_2^- (d) B_2
21. Which of the following pairs have identical values of bond order?
- (a) N_2^+ and O_2^+ (b) F_2 and Ne_2 (c) O_2 and B_2 (d) C_2 and N_2
-

22. Which of the following is correct?

- (a) During N_2^+ formation, one electron each is removed from the bonding molecular orbitals.
- (b) During O_2^+ formation, one electron each is removed from the antibonding molecular orbitals.
- (c) During O_2^- formation, one electron each is added to the bonding molecular orbitals.
- (d) During CN^- formation, one electron each is added to the bonding molecular orbitals.

23. Which of the following species are linear?

- (a) ICl^{2-}
- (b) I^{3-}
- (c) N_3^-
- (d) ClO_2

24. The structure of XeF_6 is

- (a) pentagonal bipyramidal
- (b) distorted octahedral
- (c) capped octahedral
- (d) square pyramidal

25. Which of the following have dipole moment?

- (a) Nitrobenzene
- (b) *p*-chloronitrobenzene
- (c) *m*-dichlorobenzene
- (d) *o*-dichlorobenzene

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Level – 3
Previous Year Question IIT

Fill In The Blanks

1. The angle between two covalent bonds is maximum in
(CH₄, H₂O, CO₂)
2. Pair of molecules which forms strongest intermolecular hydrogen bonds is
(SiH₄ and SiF₄, CH₃C(=O)CH₃ and CHCl₃, HC(=O)OH and CH₃C(=O)OH)
3. There are π bonds in a nitrogen molecule.
4. hybrid orbitals of nitrogen atom are involved in the formation of ammonium ion.
5. The shape of [CH₃]⁺ is
6. The valence atomic orbitals on C in silver acetylide is hybridized.
7. The kind of delocalization involving sigma bond orbitals is called
8. The two types of bonds present in B₂H₆ are covalent and
9. When N₂ goes to N₂⁺, the N–N bond distance, and when O₂ goes to O₂⁺ the O–O bond distance
10. Among N₂O, SO₂, I₂⁺ and I₂[–], the linear species are.....and

TRUE / FALSE

11. Linear overlap of two atomic *p*-orbitals leads to a sigma bond.
 12. All molecules with polar bonds have dipole moment.
 13. SnCl₂ is a non-linear molecule.
 14. In benzene, carbon uses all the three *p*-orbitals for hybridization.
-

-
15. sp^3 hybrid orbitals have equal s and p character.
16. The presence of polar bonds in a polyatomic molecule suggests that the molecule has non-zero dipole-moment.
17. H_2O molecule is linear.
18. The dipole moment of CH_3F is greater than that of CH_3Cl .

Only one option is correct:

19. Carbon tetrachloride has no net dipole moment because of:
(a) its planar structure
(b) its regular tetrahedral structure
(c) similar sizes of carbon and chlorine atoms
(d) similar electron affinities of carbon and chlorine
20. Which one among the following does not have the hydrogen bond?
(a) Phenol (b) Liquid NH_3 (c) Water (d) HCl
21. On hybridization of one s and one p -orbital we get:
(a) two mutually perpendicular orbitals
(b) two orbitals at 180°
(c) four orbitals directed tetrahedrally
(d) three orbitals in a plane
22. The bond between two identical non-metal atoms has a pair of electrons:
(a) unequally shared between the two
(b) transferred fully from one atom to another
(c) with identical spins
(d) equally shared between them
23. The hybridization of Sulphur in Sulphur dioxide is:
(a) sp (b) sp^3 (c) sp^2 (d) dsp^2
24. Of the following compounds, which will have a zero dipole moment?
(a) 1, 1 dichloroethylene (b) cis-1, 2 dichloroethylene
(c) trans 1, 2 dichloroethylene (d) None of these
25. The species in which the central atom uses sp^2 -hybrid orbitals in its bonding is:
(a) PH_3 (b) NH_3 (c) CH_3^+ (d) SbH_3
-

-
26. The molecule that has linear structure is:
 (a) CO_2 (b) NO_2 (c) SO_2 (d) SiO_2
27. The $\text{Cl}-\text{C}-\text{Cl}$ angle in 1, 1, 2, 2, tetrachloroethene and tetrachloromethane respectively will be about:
 (a) 120° and 109.5° (b) 90° and 109.5°
 (c) 109.5° and 90° (d) 109.5° 120°
28. The molecule which has zero dipole moment is:
 (a) CH_2Cl_2 (b) BF_3 (c) NF_3 (d) ClO_2
29. Which of the following is paramagnetic?
 (a) O_2^- (b) CN^- (c) CO (d) NO^+
30. The molecule which has pyramidal shape is:
 (a) PCl_3 (b) SO_3 (c) CO_3^{2-} (d) NO_3^-
31. The oxidation number of phosphorus in $\text{Ba}(\text{H}_2\text{PO}_2)_2$ is:
 (a) +3 (b) +2 (c) +1 (d) -1
32. The type of hybrid orbitals used by the chlorine atom in ClO_2^- is:
 (a) sp^3 (b) sp^2 (c) sp (d) none of these
33. For the redox reaction:

$$\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} + \text{H}^+ \longrightarrow \text{Mn}^{2+} + \text{CO}_2 + \text{H}_2\text{O}$$
 The correct coefficients of the reactants for the balanced reaction are :

$$\text{MnO}_4^- \quad \text{C}_2\text{O}_4^{2-} \quad \text{H}^+$$
- | | | | | | | | |
|-----|---|----|----|-----|----|----|---|
| (a) | 2 | 5 | 16 | (b) | 16 | 5 | 2 |
| (c) | 5 | 16 | 2 | (d) | 2 | 16 | 5 |
34. The maximum possible number of hydrogen bonds a water molecule can form is:
 (a) 2 (b) 4 (c) 3 (d) 1
35. which one of the following molecules is planar?
 (a) NF_3 (b) NCl_3 (c) PH_3 (d) BF_3
36. Among the following species, identify the isostructural pairs.
 NF_3 , NO_3^- , BF_3 , H_3O^+ , N_3H
 (a) $[\text{NF}_3, \text{NO}_3^-]$ and $[\text{BF}_3, \text{H}_3\text{O}^+]$ (b) $[\text{NF}_3, \text{N}_3\text{H}]$ and $[\text{NO}_3^-, \text{BF}_3]$
-

(c) $[\text{NF}_3, \text{H}_3\text{O}^+]$ and $[\text{NO}_3^-, \text{BF}_3]$ (d) $[\text{NF}_3, \text{H}_3\text{O}^+]$ and $[\text{N}_3\text{H}, \text{BF}_3]$

37. The number and type of bonds between two carbon atoms in CaC_2 are:
(a) one sigma (σ) and one pi (π) bonds
(b) one sigma (σ) and two pi(π) bonds
(c) one sigma (σ) and one half pi(π) bonds
(c) one sigma (σ) bond
38. Arrange the following compounds in order of increasing dipole moment toluene (I), m-dichlorobenzene (II), o-dichlorobenzene (III), p-dichlorobenzene (IV):
(a) $\text{I} < \text{IV} < \text{II} < \text{III}$ (b) $\text{IV} < \text{I} < \text{II} < \text{III}$
(b) $\text{IV} < \text{I} < \text{III} < \text{II}$ (c) $\text{IV} < \text{II} < \text{I} < \text{III}$.
39. The cyanide ion, CN^- and N_2 are isoelectronic, but in contrast to CN^- , N_2 is chemically inert, because of:
(a) low bond energy (b) absence of bond polarity
(c) unsymmetrical electron distribution
(d) presence of more number of electrons in bonding orbitals
40. Which one of the following compounds has sp^2 -hybridization?
(a) CO_2 (b) SO_2 (c) N_2O (d) CO
41. Among the following compounds the one that is polar and has the central atom with sp^2 hybridisation is:
(a) H_2CO_3 (b) SiF_4 (c) BF_3 (d) HClO_2
42. Which contains both polar and non-polar bonds?
(a) NH_4Cl (b) HCN (c) H_2O_2 (d) CH_4
43. The correct order of increasing C—O bond length of CO , CO_3^{2-} , CO_2 is:
(a) $\text{CO}_3^{2-} < \text{CO}_2 < \text{CO}$ (b) $\text{CO}_2 < \text{CO}_3^{2-} < \text{CO}$
(c) $\text{CO} < \text{CO}_3^{2-} < \text{CO}_2$ (d) $\text{CO} < \text{CO}_2 < \text{CO}_3^{2-}$
44. The oxidation number of S in S_8 , S_2F_2 , H_2S respectively, are:
(a) 0, +1 and -2 (b) +2, +1 and -2
(c) 0, +1 and +2 (d) -2, +1 and -2
45. The geometry of H_2S and its dipole moment are:
(a) angular and non zero (b) angular and zero
(c) linear and non-zero (d) linear and zero
-

-
46. The hybridization of atomic orbitals of nitrogen in NO_2^+ , NO_3^- and NH_4^+ are:
(a) sp , sp^3 and sp^2 respectively (b) sp , sp^2 and sp^3 respectively
(c) sp^2 , sp and sp^3 respectively (d) sp^2 , sp^3 and sp respectively
47. Molecular shape of SF_4 , CF_4 and XeF_4 are:
(a) the same, with 2, 0 and 1 lone pair of electrons respectively
(b) the same, with 1, 1, 1, lone pair of electrons respectively
(c) different, with 0, 1, and 2 lone pair of electrons respectively
(d) different, with 1, 0 and 2 lone pair of electrons respectively
48. The correct order of hybridization of the central atom in the following species NH_3 , $[\text{PtCl}_4]^{2-}$, PCl_5 and BCl_3 is:
(a) dsp^2 , dsp^3 , sp^2 and sp^3 (b) sp^3 , dsp^2 , sp^3d and sp^2
(c) dsp^2 , sp^2 , sp^3 , dsp^3 (d) dsp^2 , sp^3 , sp^2 , dsp^3

More than one options are correct:

49. Dipole moment is shown by:
(a) 1, 4 dichlorobenzene (b) *cis* 1, 2 dichloroethene
(d) *trans* 1, 2-dichloroethene (d) *trans* 1, 2-dichloro 2-pentene
50. CO_2 is isostructural with:
(a) HgCl_2 (b) C_2H_2 (c) SnCl_2 (d) NO_2
51. The linear structure assumed by:
(a) SnCl_2 (b) CS_2 (c) NO_2^+ (d) NCO^- (e) SO_2
52. Which of the following have identical bond order?
(a) CN^- (b) O_2^- (c) NO^+ (d) CN^+
53. The molecules that will have dipole moment are:
(a) 2, 2-dimethyl propane (b) *trans*-2-pentene
(c) *cis*-3-hexene (d) 2, 2, 3, 3-tetramethyl butane
54. Pick out the isoelectronic structure from the following:
(I) CH_3^+ (II) H_3O^+ (III) NH_3 (IV) CH_3^-
(a) I and II (b) III and IV (c) I and III (d) II, III and IV
55. The critical temperature of water is higher than that of O_2 because the H_2O molecule has:
(a) fewer electrons than O_2 (b) two covalent bonds
(c) V - shape (d) dipole moment
-

56. The geometry and the type of hybrid orbital present about the central atom in BF_3 is:

(a) linear, sp

(b) trigonal planar, sp^2

(c) tetrahedral, sp^3

(d) pyramidal, sp^3

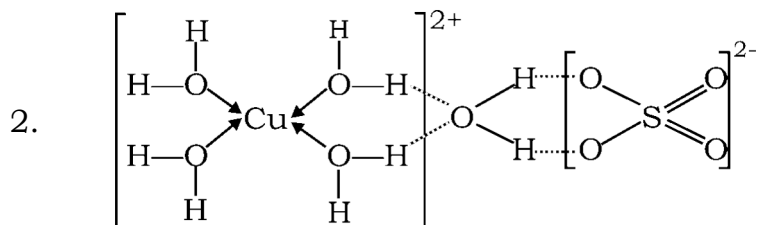
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Level -1
Answer key & Solution

Q.	Ans.	Q.	Ans.	Q.	Ans.	Q.	Ans.
1.	C	11.	B	21.	D	31.	B
2.	C	12.	C	22.	B	32.	C
3.	A	13.	C	23.	C	33.	D
4.	B	14.	C	24.	D	34.	B
5.	B	15.	D	25.	A	35.	D
6.	C	16.	A	26.	A		
7.	B	17.	C	27.	C		
8.	B	18.	B	28.	A		
9.	A	19.	D	29.	B		
10.	C	20.	B	30.	B		

Solution

- Since; e molecule (MX_3) has zero dipole moment therefore, it must have triangular planar geometry and accordingly the hybridization of central metal atom (M) must be sp^2 .



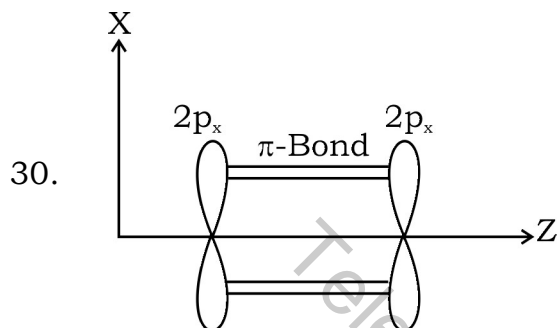
The bond between Cu^{2+} and SO_4^{2-} ion is ionic ; between S and O in SO_4^{2-} ions and between H and O atoms in H_2O are covalent : those between Cu^{2+} and H_2O molecules are coordinate.

- Electronic configuration of Cu^{2+} is

-
4. BeF_2 is linear and hence has zero dipole moment while H_2O being a bent molecule, has a finite or non-zero dipole moment.
5. BF_3 is triangular planar and hence has zero dipole moment.
6. As we move from $\text{Li} \rightarrow \text{Be} \rightarrow \text{B} \rightarrow \text{C}$, the electronegativity (EN) increases and hence the EN difference between the element and Cl decreases and accordingly the covalent character increases.
Thus option (c) i.e. $\text{LiCl} < \text{BeCl}_2 < \text{BCl}_3 < \text{CCl}_4$ is correct
7. Percentage of s-character decreases as sp (50%) $> sp^2$ (33.3%) $> sp^3$ (25.0%).
8. Electronegativity difference (EN) is highest in RbCl ($3 - 0.8 = 2.2$) and least in BeCl_2 ($3 - 1.5 = 1.5$) and hence option (b) is correct.
9. $\overset{sp^3}{\text{CH}_2} - \overset{sp}{\text{C}} \equiv \text{C} - \text{H}$.
10. SiF_4 is a symmetrical tetrahedral molecule and hence its dipole moment is zero.
11. Electrostatic forces of attraction are reduced to $1/80^{\text{th}}$ in water.
12. The C-C bond distance decreases as the multiplicity of the bond increases. Thus, bond distance decreases in the order :butane (1.54 \AA) $>$ benzene (1.39 \AA) $>$ ethene (1.34 \AA) $>$ ethyne (1.20 \AA).
13. o-Nitrophenol undergoes intramolecular H-bonding and hence exists as a monomer but p-nitrophenol undergoes intermolecular H-bonding and hence exists as an associated molecule. Therefore o-nitrophenol is more volatile than p-nitrophenol.
14. F^- forms H-Bond with HF, therefore, the species $[\text{H} \cdots \text{F} \cdots \text{H}]^-$ or HF_2^- exists and hence option (c) is correct.
15. B.O. in $\text{N}_2 = (10 - 4)/2 = 3$
B.O. in $\text{N}_2^+ = (9 - 4)/2 = 2.5$
B.O. in $\text{O}_2 = (10 - 6)/2 = 2.0$
B.O. in $\text{O}_2^+ = (10 - 5)/2 = 2.5$
 N_2^+ contains one unpaired electron and hence is paramagnetic. Therefore option (d) is wrong. All other statements are correct.
16. H-bonding interactions.
-

-
17. Since the element X forms XCl_3 , X_2O_5 and Ca_3X_2 , therefore, it must be N or P. Since it does form MCl_5 therefore, it must be N since it has no d-orbitals to expand its covalency from 3 to 5. Therefore, X must be N.
18. Total no. of valence electrons in $\text{SO}_2 = 6 + 2 \times 6 = 18$
 Now $18 \div 8 = 2(Q_1) + 2(R_1)$ And $2 \div 2 = 1(Q_2) + 0(R_2)$
 Thus, sum of $Q_1 + Q_2 + R_2 = 2 + 1 + 0 = 3$
 and hence type of hybridization is sp^2 .
19. Metallic luster is due to oscillation of loose electrons.
20. Because of highest electronegativity of F, $\text{F-H}\cdots\text{F}$ hydrogen bond is the strongest.
21. From VB theory, B.O. in CO, i.e. : $\bar{\text{C}} \equiv \overset{+}{\text{O}} : \text{is } 3$ that of $\text{O} = \text{C} = \text{O}$ is 2 while that of CO_3^{2-} ion is 1.33. Since the bond length increases as the bond order decreases, i.e., $\text{CO} < \text{CO}_2 < \text{CO}_3^{2-}$. Thus option (d) is correct.
22. In NO_2^+ , total no. of valence electrons $= 5 + 2 \times 6 - 1 = 16$
 Now $16 \div 8 = 2(Q_1) + 0(R_1) = 2$
 Thus, type of hybridization is sp .
 In NO_3^- total no. of valence electrons $= 5 + 3 \times 6 + 1 = 24$
 Now, $24 \div 8 = 3(Q_1) + 0(R_1) = 3$
 Thus, type of hybridization $= \text{sp}^2$.
 In NO_4^+ ions, total no. of valence electrons $= 5 + 1 \times 4 - 1 = 8$
 Now $8 \div 2 = 4(Q_1) + 0(R_1) = 4$
 Thus, type of hybridization is sp^3 .
 Combining all the results, option (b) is correct.
23. No. of antibonding electron pairs in O_2^{2-} is 4
 i.e., $\sigma^* 1s^2$, $\sigma^* 2s^2$, $\pi^* 2p_x^2$ and $\pi^* 2p_y^2$.
24. Only BCl_3 is electron deficient.
25. H_2O has highest boiling point due to hydrogen bonding.
26. All the species are isoelectronic since each one of them has 14 electrons distributed in the MO's as under:
 $\sigma(1s)^2$, $\sigma^*(1s)^2$, $\sigma(2s)^2$, $\sigma^*(2s)^2$, $\sigma(2p_z)^2$, $\pi(2p_x)^2$ and $\pi(2p_y)^2$.
 Thus $\text{B.O} = \frac{1}{2}(10 - 4) = 3$.
-

27. O_2^- has one unpaired electron in $\pi^*(2p)$ orbital.
28. The molecular plane does not have any π -electron density.
29. (b) on the basis of electronic configuration.



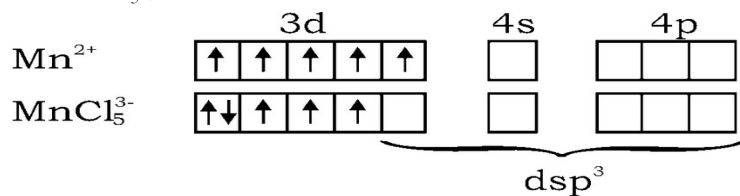
31. Both CN^- and N_2 molecules have the same MO diagrams but differ only in bond polarity. Thus N_2 is inert due to absence of bond polarity while CN^- ion is reactive due to presence of bond polarity.

32. Fractional charge (δ) on each atom = $\frac{\text{Dipole moment}}{\text{Distance}} = \frac{1.2D}{1.0 \text{ \AA}}$

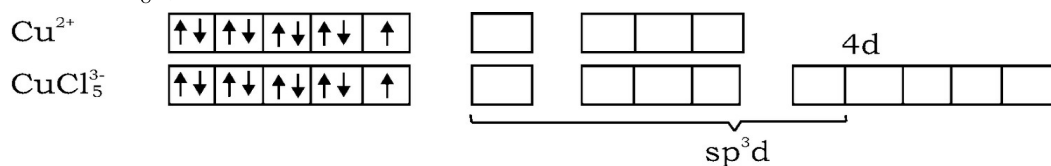
$$= \frac{1.2 \times 10^{-18} \text{ esu cm}}{1.0 \times 10^{-8} \text{ cm}} = 1.2 \times 10^{-10} \text{ esu}$$

$$\text{Percentage of electronic change} = \frac{1.2 \times 10^{-10} \text{ esu}}{4.8 \times 10^{-10} \text{ esu}} \times 100 = 25\%$$

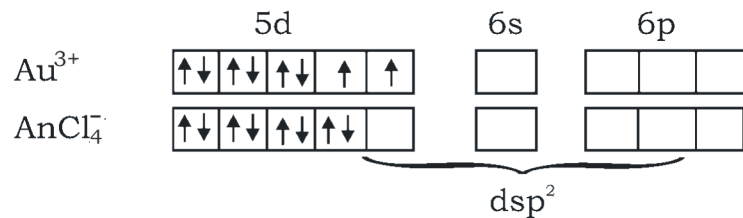
33. Smaller the size of the anion (F^-) lesser is its polarization and hence more is the ionic character. Thus $AlCl_3$ is covalent while AlF_6 is ionic – Fajan rule.
34. Curve 2 represents the most stable state because in this curve energy decreases as the atoms come close together and there is minimum in the curve where energy is minimum and hence stability is maximum.
35. In $MnCl_5^{3-}$, Mn is in +2 oxidation state.



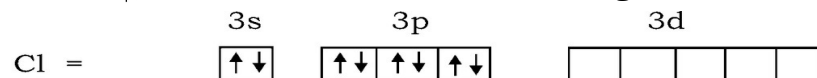
In $CuCl_5^{3-}$, Cu is in +2 oxidation state



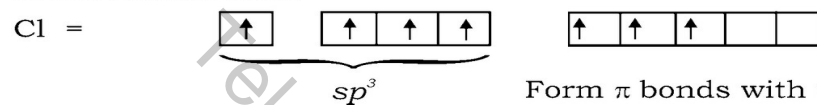
In AuCl_4^- , Au is in +3 oxidation state



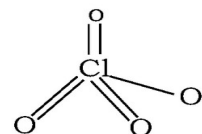
In ClO_4^- , Cl is the central atom. In the ground state, we have



In the excited state



Form π bonds with three O-atoms



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Level -2
Answers key & Solution

Q. No	Ans	Q. No	Ans	Q. No	Ans
1.	A, B, C, D	10.	B, C	19.	A, B, C
2.	A, B	11.	A, B, C	20.	A, B, C
3.	A, B	12.	A, B, C	21.	A, C
4.	A, B, C	13.	A, B, C, D	22.	A, B, D
5.	A, B, C	14.	B, D	23.	A, B, C
6.	A, B, C	15.	A, B, C, D	24.	B, C
7.	A, B, C	16.	A, B, C	25.	A, B, C, D
8.	A, C	17.	A, B, C		
9.	B, C	18.	A, B		

2. Apply Fajan's rules and also consider the effects of polarization.

4. BrF_5 (14 electrons), SF_6 (12 electrons), IF_7 (14 electrons)

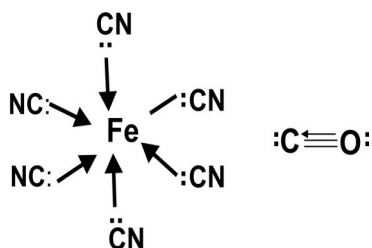
6. NO ($5 + 6 = 11$ valence electrons)

NO_2 ($5 + 12 = 17$ valence electrons)

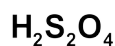
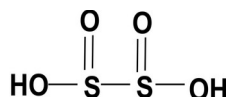
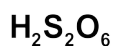
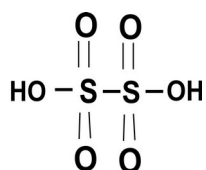
ClO_2 ($7 + 12 = 19$ valence electrons)

All molecules have odd-electrons and are paramagnetic.

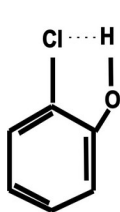
9.



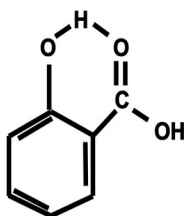
10.



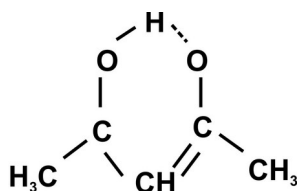
16.



2-Chlorophenol



Salicylic acid



enol form of acetyl acetone

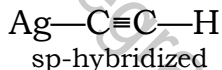
(All molecules have intramolecular hydrogen bonds.)

17. From the molecular orbital theory, we know that these species have a bond order equal to zero. The number of unpaired electrons they possess is also zero. Hence they are diamagnetic.
18. From the molecular orbital theory, we know that B_2 and O_2 have two unpaired electrons each. Hence they are paramagnetic.
23. The species in options (a), (b) and (c) are sp -hybridized and are, therefore, linear.

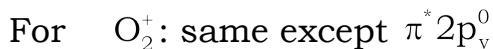
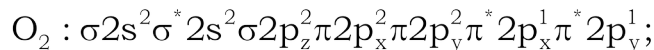
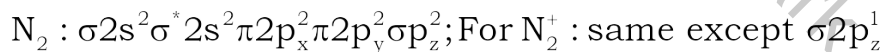
Level – 3

FILL IN THE BLANKS

1. CO_2 ; sp hybridisation of C-atom with hybrid orbitals being farthest.
2. HCOOH and CH_3COOH ;
3. 2; As there is a triple bond between the two nitrogen atoms, so there are 1σ and 2π -bonds.
4. sp^3 ;
5. Planar;
6. sp



7. **Hyperconjugation:** Hence, it involve between σ -electrons of alpha C—H bond and π -electrons of conjugated system. So it is also called as σ -conjugation.
8. Three centred two electron bonds or banana bond; The formation of three centred two electron bond is due to one empty sp^3 orbital of one of the B atom, $1s$ orbital of the bridge hydrogen atom and one of the sp^3 (filled) orbital of the other B-atom. This forms a decolourized orbital covering the three nuclei giving the shape of a banana. Thus also known as banana bonds.
9. Increases, decreases; The molecular configurations of N_2 and O_2 are as follows



$$\therefore \text{Bond order in } \text{N}_2 = \frac{1}{2}(8 - 2) = 3 \quad \text{And bond order in } \text{N}_2^+ = \frac{1}{2}(7 - 2) = 2.5$$

Thus conversion of N_2 to N_2^+ decreases bond order (from 3 to 2.5) and hence increases the N—N bond distance.

$$\text{Bond order in } \text{O}_2 = \frac{1}{2}(8 - 4) = 2 \quad \text{and bond order in } \text{O}_2^+ = \frac{1}{2}(8 - 3) = 2.5$$

Thus conversion of O_2 to O_2^+ increases bond order (from 2 to 2.5) hence decreases O—O bond distance.

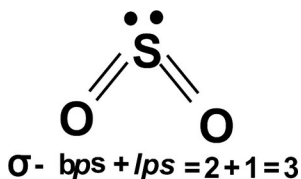
10. N_2O , I_3^- ; Linear species are N_2O and I_3^- .

TRUE / FALSE

11. Head on (or linear) overlap of two atomic orbitals leads to a sigma bond.
12. The vector addition of all the bond moments may or may not be zero.
13. SnCl_2 has both bond pair (2) as well as lone pair (1) of electrons. It is sp^2 hybridised and trigonal planar in shape.
14. Only two orbitals since C in benzene is in sp^2 hybridised state.
15. sp^2 hybrid orbitals do not have equal s(33.3%) and p(66.66%) character.
16. Reason is as in Q.2.
17. H_2O molecule is V-shaped.
18. C-F has largest bond polarity.

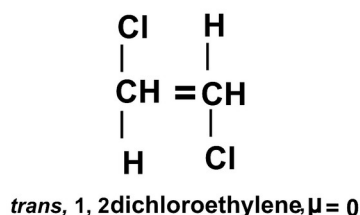
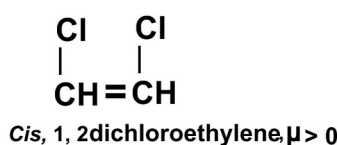
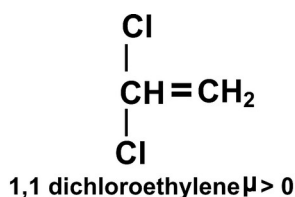
Only one option is correct:

19. Carbon tetrachloride has no dipole moment because of its regular tetrahedral structure, which is symmetrical.
20. Hydrogen bond may form by oxygen, nitrogen and fluorine only.
21. Bond angle between two sp-hybrid orbitals is 180° .
22. Two identical non-metal atoms form non-polar covalent bond.
- 23.



$\therefore \text{sp}^2$ -hybridisation

24.



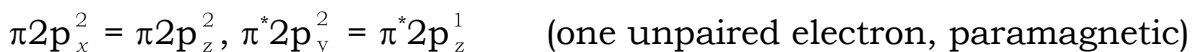
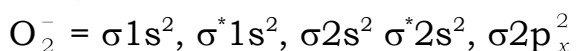
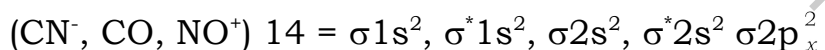
25. In CH_3^+ , carbon atom is in sp^2 -hybridized state.

26. Due to sp -hybridization

27. In 1, 1, 2, 2 tetrachloroethene, each carbon is sp^2 hybridized thus having bond angle 120° and in tetrachloromethane carbon is sp^3 -hybridized, hence bond angle is 109.5°

28. BF_3 is a symmetric molecule having zero dipole moment.

29. CN^- , CO and NO^+ are isoelectronic with 14 electrons each and there is no unpaired electrons in the MO. configuration of these species. So these are diamagnetic. O_2^- is paramagnetic due to the presence of one unpaired electron.



30. PCl_5 has $sp^3 d$ -hybridization, hence geometry is **trigonal bipyramidal**.

31. $\text{Ba}(\text{H}_2\text{PO}_2)_2$

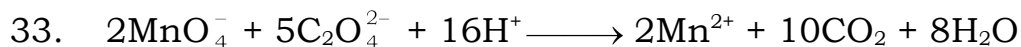
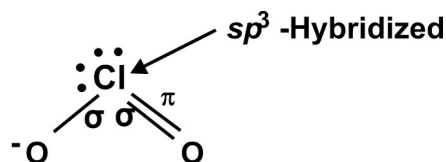
Let the oxidation number of P is x

$$\therefore (+2) + (+1 \times 4) + (x \times 2) + (-2 \times 4) = 0$$

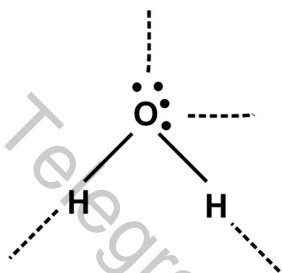
$$\text{or} \quad 2 + 4 + 2x - 8 = 0 \quad \text{or} \quad 2x - 2 = 0$$

$$\text{or} \quad 2x = +2 \quad \therefore \quad x = \frac{2}{2} = +1$$

32.



34.

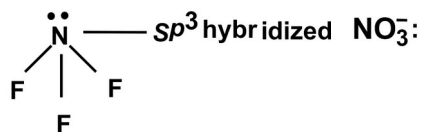


Hence, four H-bonds may be formed by one water molecule

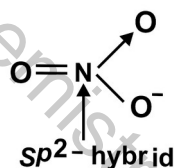
35. Due to sp^2 -hybridization

36. Given species have following structures:

NF_3 :

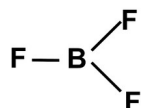


Pyramidal structure



Trigonal planar structure

BF_3 :

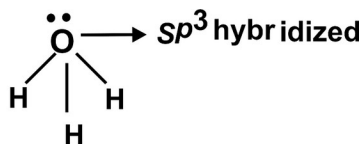


sp^2 hybridized

Trigonal symmetric structure

These three sp^2 -hybrid orbitals are attached to each other trigonally with an angle of 120° and they are overlapped with three p -orbitals of three F-atoms on their axes. Hence the geometry of BF_3 molecule is trigonal planar.

H_3O^+ :



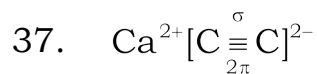
Pyramidal structure

HN_3 :



Linear structure

Thus isostructural pairs are $[\text{NF}_3, \text{H}_3\text{O}^+]$ and $[\text{NO}_3^-, \text{BF}_3]$

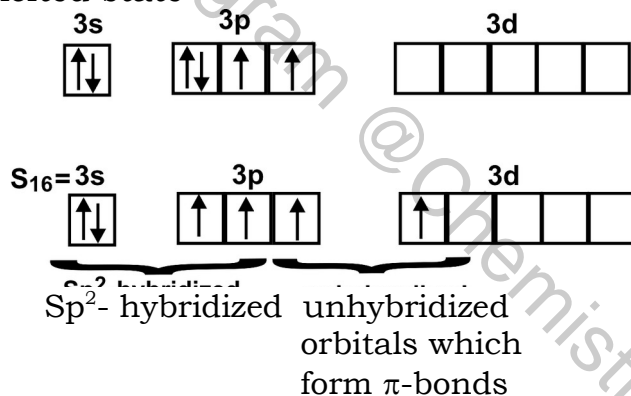


$\therefore \sigma - \text{bond} = 1$
 $\pi - \text{bonds} = 2$

38. The increasing order of dipole-moment p -dichlorobenzene < toluene < m -dichlorobenzene < o -dichlorobenzene

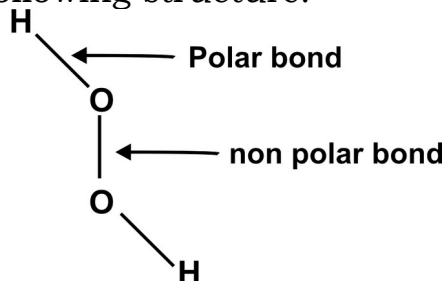
39. Due to absence of polarity of bond.

40. In SO_2 molecule, S is sp^2 -hybridized
 In ground state $\text{S}_{16} = 1s^2, 2s^2, 2p^6, 3s^2, 3p^4, 3d^0$
 In. excited state



41. H_2CO_3 is polar and C is sp^2 -hybridized

42. H_2O_2 has following structure:



Hence, it contains polar and non polar bonds.

43. Bond length $\propto \frac{1}{\text{Bond order}}$

Bond order: $\text{CO}_3^{2-} < \text{CO}_2 < \text{CO}$

Bond order in CO = 3 (with the help of molecular orbital theory)

Bond order in CO_2

$$= \frac{\text{No. of bonds in all possible sides}}{\text{No. of resonating structure}} \quad (\text{by resonance})$$

$$= \frac{4}{2} = 2$$

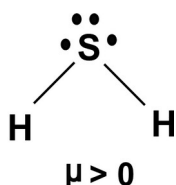
$$\text{Bond order in } \text{CO}_3^{2-} = \frac{4}{3} = 1.33 \quad (\text{by resonance})$$

So order of bond length of $\text{C}-\text{O}$

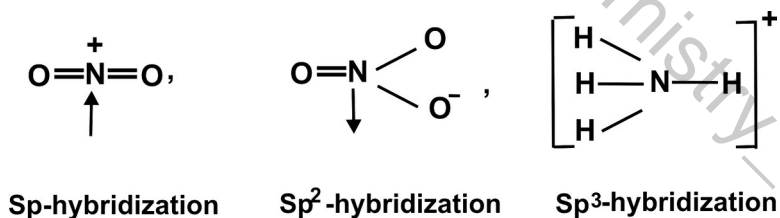


44. Oxidation No of S in $\text{S}_8 = 0$
Oxidation No. of S in $\text{S}_2\text{F}_2 = +1$
Oxidation No. of S in $\text{H}_2\text{S} = -2$

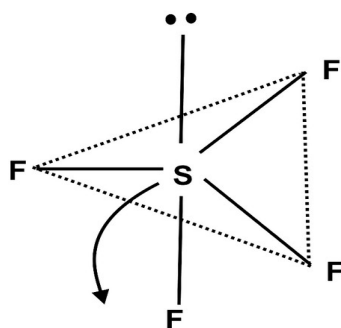
45.



46.

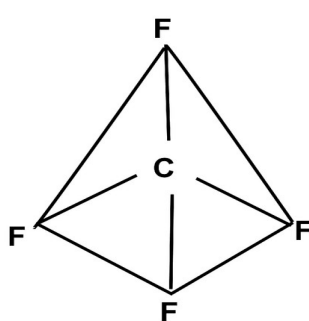


47.



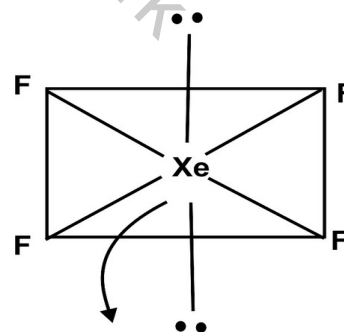
sp^3d hybrid

(Trigonal bipyramidal shape)
(Contains one lone pair)



sp^3 hybrid

(No lone pair)



sp^3d^2 hybrid

(Square planar shape of octahedral)
(Contains two lone pair)

48. In NH_3 , N is sp^3 -hybridized

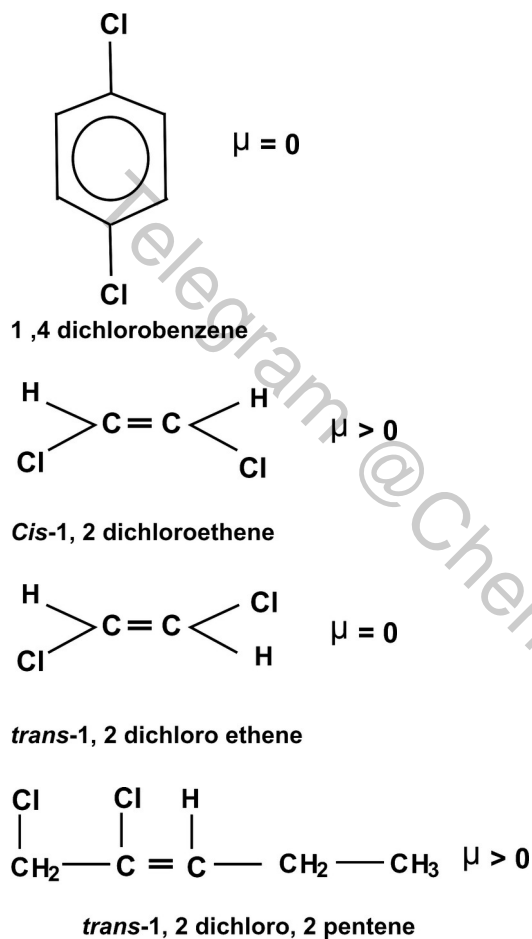
In $[\text{PtCl}_4]^{2-}$ N is dsp^2 -hybridized

In PCl_5 , P is $sp^3 d$ -hybridized

In BCl_3 , B is sp^2 -hybridized

More than one options are correct:

49.



50. CO_2 , HgCl_2 and C_2H_2 are linear molecules having sp -hybridization.

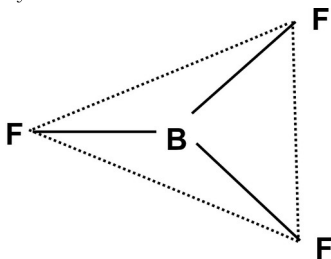
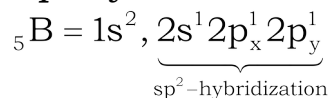
51. $[\text{O}=\text{N}=\text{O}]^+$, $[\text{N}\equiv\text{C}-\text{O}]^-$, $\text{S}=\text{C}=\text{S}$

In CS_2 , carbon is sp -hybridized, so it is linear. NCO^- and NO_2^+ are isoelectronic to CS_2 , thus they are also, linear.

52. In CN^- and NO^+ bond order is three.

53. (a) and (d) are symmetric alkanes, hence these are non polar, while (b) and (c) are symmetric alkenes hence they possess dipole moment.

-
54. Isoelectronic structure are H_3O^+ , NH_3 and CH_3^- . All the molecules have ten electrons.
55. Critical temperature of water is higher than O_2 because H_2O molecule has dipole moment. Which is due to its V-shape.
56. In BF_3 , B is sp^2 -hybridized



These three sp^2 -hybrid orbitals are attached to each other trigonally with an angle of 120° and they are overlapped with three p-orbitals of three F-atoms on their axes. Hence the geometry of BF_3 molecule is trigonal planar.

Different Type Chemical Bonding Questions

1 Match the Following:

Correctly match the following properties in the same order (greater vs greater or less vs less) given in Column-I and Column-II for BeO and MgO (taken in order)

Column I		Column II	
(a)	Lattice energy	(p)	Hydration energy
(b)	Basic character	(q)	Melting points
(c)	Ionic character	(r)	Refractory nature
(d)	Thermal stability	(s)	Amphoteric nature
		(t)	Solubility

Key: (A \rightarrow p,q, r,s)

(B \rightarrow t)

(C \rightarrow t)

(D \rightarrow p,q, r, s)

Hint: Conceptual

2. Match the following:

Column I		Column II	
(A)	CO	(p)	Bond order is 1
(B)	NO ⁺	(q)	Bond order is 2
(C)	O ₂ ²⁻	(r)	Bond order is 3
(D)	C ₂	(s)	π -acceptor ligand
		(t)	Diamagnetic

KEY: (A – r, s, t), (B – r, s, t), (C – p, t), (D – q, t)

3.

Column – I		Column II	
(A)	$\text{NH}_3 > \text{SbH}_3 > \text{AsH}_3 > \text{PH}_3$	(p)	Dipole moment
(B)	$\text{HI} > \text{HBr} > \text{HCl} > \text{HF}$	(q)	Reducing property
(C)	$\text{SnH}_4 > \text{GeH}_4 > \text{SiH}_4 > \text{CH}_4$	(r)	Enthalpy of vaporization
(D)	$\text{H}_2\text{O} > \text{H}_2\text{Te} > \text{H}_2\text{Se} > \text{H}_2\text{S}$	(s)	Boiling point

Key: (A) → (P), (S);

(B) → (Q),

(C) → (Q), (R), (S),

(D) → (S), (R)

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4. Match the following

Column-I	Column-II
A) $d_{x^2-y^2}$ atomic orbital	p) One nodal plane
B) P_y atomic orbital	Q) Two nodal planes
C) σ_{P_x} molecular orbital	R) $\Psi(g)$ [gerade]
D) $\pi_{p_y}^*$ molecular orbital	S) $\Psi(u)$ [Ungerade]

KEY: **A-Q,R**

B-P,R

C-R

D-Q,R

HINT:

5. Match the following

Column-I	Column-II
A) XeF_4	p) sp^3d^2 , Square planar
B) SF_4	Q) sp^3 , tetrahedral
C) IF_4^+	R) sp^3d , see-saw
D) SO_4^{2-}	S) Has lone pair(s) on the central atom

KEY: **A-P,S**

B-R,S

C-R,S

D-Q

HINT:

20. Column - I Column - II

A) Linear shape

p) XeF_2

B) sp hybridisation

C) sp^3d hybridisation

D) Isoelectronic species

q) ICl_2^-

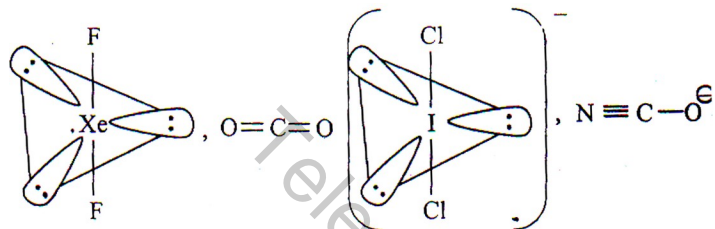
r) CO_2

s) NCO^-

t) $CH \equiv CH$

KEY: A-P, Q, R, S, T; B-R, S, T; C-P, Q; D-R, S

HINT: Ans : A – pqrst ; B – rst ; C – pq ; D – rs



All have linear shape, sp hybridisation is for CO_2 , NCO^- and $HCCH$. sp^3d hybridization is observed for XeF_2 and

Isoelectronic species are CO_2 and NCO^- , each having 22 electrons

21. **Column - I**

A) I_3^-

B) NH_4^+

C) ClF_3

D) SF_4

Column - II

p) linear

q) T-shape

r) sea-saw

s) Tetrahedral

t) hybridisation

KEY: **A** p,t; **B** s; **C** q,t; **D** r,t

HINT: Conceptual.

1. **Column - I**

A) Fractional bond order

B) Paramagnetic

C) Bond order - 3

D) Bond order 2-5

Column - II

p) O_2^-

q) O_2^+

r) NO^+

s) CN

t) CO

KEY: **A** p,t; **B** s; **C** q,t; **D** r,t

HINT:

Passage – 1:

In the molecular orbital theory, the valence e^-s are considered to be associated with the nuclei, in the molecule; these atomic orbital from different atom must be combined to produce molecular orbitals;

These molecular orbitals then filled with the available e^-s according to the same rule for atomic orbitals and the total energy of the e^-s in the molecular orbitals is compared with initial total energy of e^-s in atomic orbitals.

1. When two molecular orbitals of same symmetry have similar energy then they interact
 - A) To lower the energy of lower and higher orbitals
 - B) To lower the energy of lower orbital and to raise the energy of higher orbital
 - C) To raise the energy of lower and higher orbitals
 - D) To raise the energy of lower orbital and to lower the energy of higher orbital

KEY:B

Hint: Conceptual

2. Which of the following statement are true ?
 - i) In N_2 , the doubly degenerate π_{2p} orbitals are completely filled.
 - ii) In O_2 , the energy of σ_{2p_x} orbital is lower than the doubly degenerate π_{2p} orbitals.
 - iii) Different molecular species with the same configuration have the same energy.
 - iv) A π_{2p}^* orbital has two nodal planes

A) i, ii and iv B) i and ii only C) i, ii, iii and iv D) ii, iii, iv

KEY:A

Hint: The $2p_z$ orbital in O_2 is than $2p_x$ in O_2 and more than $2p_x$ in N_2 from MOT.

3. Correct bond order for $\begin{matrix} NO^- & NO^+ & NO \\ (1) & (2) & (3) \end{matrix}$

- A) $1 > 2 > 3$ B) $3 > 2 > 1$ C) $2 > 3 > 1$ D) $2 < 1 < 3$

KEY: C

HINT: $B.O \Rightarrow NO = 2$

$$NO^+ = 2.5; \quad NO^- = 1.5$$

$$NO^+ > NO > NO^-$$

Passage - 2

The degree of polarity of a covalent bond is measured by the dipole moment (μ_{bond}) of the bond is defined as $\mu_{\text{bond}} = e \times d$ the dipole moment of a molecule is the vector addition of all the bond dipole moments present in it. In triatomic molecule.

$$\mu_{\text{molecule}}^2 = \mu_1^2 + \mu_2^2 + 2\mu_1 \mu_2 \cos\theta$$

$$\% \text{ Ionic character} = \mu_{\text{obs}}/\mu_{\text{theo}} \times 100$$

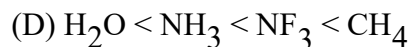
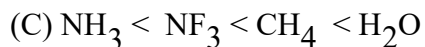
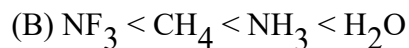
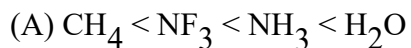
4. Which bond angle θ would result in the maximum dipole moment for the triatomic molecule xy_2 is

- (A) $\theta = 90^\circ$ (B) $\theta = 120^\circ$ (C) $\theta = 150^\circ$ (D) $\theta = 180^\circ$

KEY: A

HINT: $\mu \propto \frac{1}{\theta}$

5. The correct order of dipole moment is



KEY: A

HINT: Conceptual

6. Arrange the following compounds in order of increasing dipole moment

Toluene (I), m-dichloro benzene (II), O-dichloro benzene (III), p-dichloro benzene (IV)



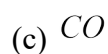
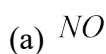
KEY: C

HINT: Conceptual

Passage - 3

According to molecular orbital theory all atomic orbitals combine to form molecular orbital by LCAO (Linear Combination of Atomic Orbitals) method. When two atomic orbitals have additive (constructive) overlapping the form bonding molecular orbitals (BMO) which have lower energy than atomic orbitals where as when atomic orbitals overlap subtractively, higher energy antibonding molecular orbitals (ABMO) are formed. Each M.O occupies two electrons with opposite spin. Distribution of electrons in M.O follows aufbau principal as well as Hund's rule. M.O. theory can successfully explain magnetic behaviour of molecules.

7. Which of the following is not paramagnetic?



KEY: C

8. Bond strength increases when

(a) Bond order increases

(b) Bond length increases

(c) Antibonding electrons increases

(d) Bond angle increases.

KEY: A

9. O_2^{2-} will have

- (a) Bond order equal to that of H_2 and diamagnetic
- (b) Bond order equal to that of H_2 and paramagnetic
- (c) Bond order equal to that of N_2 and diamagnetic
- (d) Bond order higher than that of O_2 .

KEY: A

Passage - 4

The rule governing the transition from ionic to covalent bonding is called Fajan's rule. By this rule the degree of covalency of molecules are known. When an anion and cation approach each other then the electron cloud of anion is not only attracted by the nucleus, but also by the charge on cation. At the same time the cation also tends to repel, the positively charged nucleus of anions. The combined effect of these two forces is that electron cloud of anion is elongated towards the cation. This ability of cation to polarize anion is known polarization power of cation. The higher is the polarization power of cation higher is the covalent character of the molecule. Effective nuclear charge of pseudo noble gas configuration is higher than that of noble gas configuration.

10. Which of the following anion is the softest anion

- (A) C^{4-}
- (B) N^{3-}
- (C) O^{2-}
- (D) F^{-}

Key: A

11. Which of the following is the increasing order of covalent character of the compound

- (A) $AgCl < CuCl < KCl < NaCl$
- (B) $KCl < NaCl < CuCl < AgCl$
- (C) $KCl < NaCl < AgCl < CuCl$
- (D) $NaCl < KCl < AgCl < CuCl$

Key: C

Hint: Cu^{+} and Ag^{+} has pseudo inert gas configuration

$$r_{\text{Cu}^+} < r_{\text{Ag}^+}$$

And $r_{\text{Na}^+} < r_{\text{K}^+}$

12. Which of the following has highest melting point ?

(A) LiF

(B) LiCl

(C) LiBr

(D) LiI

Key: A

Hint: LiF is most ionic, because F^- is small in size therefore it has least polarisability and has high melting point.

Passage - 5

Polar covalent molecules exhibit dipole moment. Dipole moment is equal to the product of charge separation, q and the bond length d for the bond. Unit of dipole moment is debye. One debye is equal to 10^{-18} esu cm.

Dipole moment is a vector quantity. It has both magnitude and direction. Hence, dipole moment of a molecule depends upon the relative orientation of the bond dipoles, but not on the polarity of bonds alone. A symmetrical structure shows zero dipole moment. Thus, dipole moment helps to predict the geometry of a molecule. Dipole moment values can be used to distinguish between *cis* – and *trans* – isomers; *ortho* -, *meta* – and *para* – forms of a substance, etc.

13. A diatomic molecule has a dipole moment of 1.2 D. If the bond length is 1.0×10^{-8} cm, what fraction of charge does exist each atom ?

(A) 0.1

(B) 0.2

(C) 0.25

(D) 0.3

Key: C

14. Arrange the following compounds in increasing order of dipole moments, toluene (I), o-dichlorobenzene (II), m – dichlorobenzene (III) and p – dichlorobenzene (IV)

(A) IV < I < II < III

(B) I < IV < II < III

(C) $IV < I < III < II$

(D) $IV < II < I < III$

Key: C

15. μ of the AX_4 type of molecule is zero. The geometry of it can be :

(A) tetrahedral

(B) square planar

(C) A or B

(D) none of these

Key: C

Passage – 6:

The first real compound of noble gases was made in 1962 by Bartlett, soon after this there was a rapid extension of the chemistry of the noble gases and in particular of xenon.

Xenon reacts directly with fluorine when heated at 400°C in a sealed nickel tube. The products depend on the ratio of Xe and F_2 . A 1:20 mixture of Xe and F_2 on heating gives XeF_6 , which is a white solid. It undergoes slow hydrolysis in small quantity of water forming a xenon oxyfluoride (A) with Xe, O and F weight ratio 2.62 : 0.32 : 1.52. It undergoes complete hydrolysis in excess of water forming an oxide (B) in the same oxidation state. When the oxide (B) reacts with (A) it forms another compound (C) with formula XeO_2F_2 . XeF_6 can act as a fluoride donor and forms a complex (D) with AsF_5 . The complex in the crystalline form is found to contain monovalent ions in which 'Xe' is present in the cationic part. (Xe=131)

16. In the partial hydrolysis of XeF_6 the hybridization of Xe changes from

A) $\text{sp}^3\text{d}^2 - \text{sp}^3\text{d}$

B) $\text{sp}^3\text{d}^3 - \text{sp}^3$

C) $\text{sp}^3\text{d}^3 - \text{sp}^3\text{d}$

D) $\text{sp}^3\text{d}^3 - \text{sp}^3\text{d}^2$

KEY: D

17. The shape of the molecule (B) is,

A) Tetrahedral

B) Pyramidal

C) Octahedral

D) Angular

KEY: B

18. The correct order of bond angles in the compounds 'A' and 'B' is,

A) $A > B$

B) $A < B$

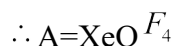
C) $A \neq B = 90^{\circ}$

D) $A = B =$

90°

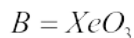
KEY: B

67, 68 & 69 HINT: The atoms ratio in (A) is 1:1:4

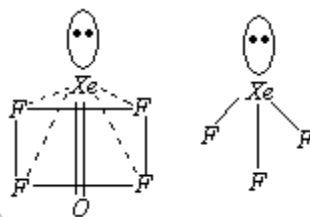


Hybridisation of Xe in XeOF_4 is sp^3d^2 .

Due to Lp-bp repulsions it becomes slightly non-planar sq. pyramidal



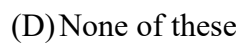
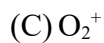
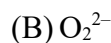
Hybridisation of Xe is sp^3



passage - 7

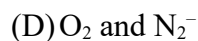
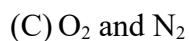
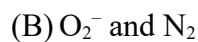
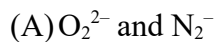
According to MOT, two atomic orbitals overlap resulting in the formation of molecular orbitals. Number of atomic orbitals overlapping together is equal to the molecular orbital formed. The two atomic orbitals thus formed by LCAO (linear combination of atomic orbital) in the same phase or in the different phase are known as bonding and antibonding molecular orbitals respectively. The energy of bonding molecular orbital is lower than that of the pure atomic orbital by an amount Δ . This is known as the stabilization energy. The energy of antibonding molecular orbital is increased by Δ' (destabilisation energy).

19. The bond order of N_2^- is equal to that of:



KEY: C

20. Which among the following pairs contain both paramagnetic species.



KEY: D

21. Which of the following statements is true according to M.O.T.:

- (A) Higher the bond order less the bond length
- (B) Higher the bond order greater the bond length
- (C) Higher the bond order lesser the bond energy
- (D) Higher the bond order less the number of bonds.

KEY: A

Passage - 8

According to molecular orbital theory in a molecule electrons are added in molecular orbitals in order of their increasing energy. The number of electrons in the molecular orbitals is equal to the sum of all the electrons on the bonding atoms. Like an atomic orbital each molecular orbital can accommodate upto two electrons with opposite spins (in accordance with the Pauli exclusion principle). When electrons are added to molecular orbitals of the same energy, the most stable arrangement is predicted by Hund's Rule; i.e., electrons enter these molecular orbitals singly with parallel spins.

Constructive and destructive interaction between the wave functions of two hydrogen 1s orbitals lead to the formation of a bonding (σ_s) and an antibonding molecular orbitals (σ_s^*). In the bonding molecular orbital, there is concentration of electron cloud between the nuclei of atoms which acts as a negatively charged glue to hold the positively charged nuclei together. In the antibonding molecular orbital there is a node between the nuclei that signifies zero electron density. However, the energies of molecular orbitals actually increase as follow.

$$\sigma_{1s} < \sigma_{1s}^* < \sigma_{2s} < \sigma_{2s}^* < \pi_{2p_y} = \pi_{2p_z} < \sigma_{2p_x} < \pi_{2p_y}^* = \pi_{2p_z}^* < \sigma_{2p_x}^*$$

This order is valid upto $z \leq +7 \times 2$. The energy of σ_{2p_x} is lower in energy than the π_{2p_y} and π_{2p_z} orbitals for O_2 and F_2 . To evaluate the stabilities of species we determine their bond order, defined as

$$\text{Bond order} = \frac{1}{2} (\text{No. of electron in B.M.Os} - \text{No. of electrons in ABMOs})$$

A bond order zero means the bond has no stability and the molecule cannot exist. The bond order indicates the strength of a bond. Presence of unpaired electron in molecular orbitals make the species paramagnetic, and the removal of electron from bonding M.O is more difficult than that of anti bonding M.O.

22. Which is not true for MOT?

- (A) Some atomic orbitals keep their existence in a molecule while some convert into MOs.
- (B) Molecular orbitals also follow Pauling's exclusion principle and Hund's rule besides aufbau principle
- (C) In the ABMO, the nuclei are repelled by each others positive charges rather than held together.
- (D) In a stable molecule, the number of electrons in B.M.Os is always greater than that in ABMOs.

KEY: A

23. Among the following which is not paramagnetic?

- (A) O_2^+
- (B) O_2^-
- (C) O_2
- (D) O_2^{2-}

KEY: B

24. Which is false according to MOT?

- (A) H_2^+ and He_2^+ have same stability
- (B) H_2 is stabler than H_2^+
- (C) He_2^+ may exist while He_2 cannot
- (D) same bond order of two species do not mean they have same bond energy

KEY: A

Passage - 9

The shape of a molecule is determined by electron-pair repulsions in the valence shell. A lone pair occupies larger space than a bond pair because it is not shared by two nuclei. Thus the lone pair-lone pair repulsion is greater than the lone pair-bond pair repulsion, which in turn is greater than the bond pair-bond pair repulsion. The presence of lone pairs causes distortion of bond angles and hence a deviation from an ideal shape. The extent of distortion depends upon the

orientation of the lone pairs around the central atom. In a trigonal bipyramid, the lone pairs occupy equatorial positions than the apical ones.

In AB_n type molecules, as the electronegativity of A increases, the bond pairs come closer and the repulsion between them increases. On the other hand, as electronegativity of B increases, the bond pairs get farther and repulsion decreases.

25. Which of the following statements is true?

- (A) F-N-F angle in NF_3 is greater than H-N-H angle in NH_3
- (B) F-N-F angle in NF_3 is smaller than H-N-H angle in NH_3
- (C) H-O-H angle in H_2O is greater than H-N-H angle in NH_3
- (D) F-O-F angle in F_2O is greater than H-O-H angle in H_2O

KEY: B

HINT:

26. The shape of which of the following molecules will not be distorted?

- (A) BrF_3
- (B) ClF_3
- (C) XeF_4
- (D) XeF_6

KEY: C

HINT:

27. Which of the following species will have the lone pair effects cancelled?

- (A) ICl_2^-
- (B) ClF_3
- (C) PCl_3
- (D) BrF_5

KEY: A

HINT:

Passage - 10

Atomic orbitals add together to give a superposition called a molecular orbital or MO. Molecular orbitals are bonding when the orbital phase considerations are favourable. The bonding MO wave function, Ψ (psi), can be squared, $|\Psi|^2$, to represent electron density. A bonding MO shows a build up of electron density between the two positively charged nuclei.

- The two positive nuclei are both attracted to the region of electron density and are shielded from each other.

- This, in essence, is the covalent bond.

If the atomic orbitals are "out of phase", the AO/AO interaction will exhibit a *phase node* – a region in space with zero electron density – between the positive nuclei. There will be nothing to attract the nuclei together and the MO is (said to be) antibonding.

Molecular orbitals like the atomic orbitals are filled in accordance with the Aufbau Principle obeying the Pauli's Principle and the Hund's rule.

Order of energy of various molecular orbitals is as follows:

For O₂ and higher molecules

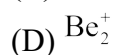
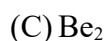
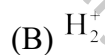
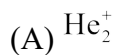
$\sigma 1s, \sigma^* 1s, \sigma 2s, \sigma^* 2s, \sigma 2p_x, [\pi 2p_y = \pi 2p_z], [\pi^* 2p_y = \pi^* 2p_z], \sigma^* 2p_x$

For N₂ and lower molecules

$\sigma 1s, \sigma^* 1s, \sigma 2s, \sigma^* 2s, [\pi 2p_y = \pi 2p_z], \sigma 2p_x, [\pi^* 2p_y = \pi^* 2p_z], \sigma^* 2p_x$

Bond order is given by half the difference in the number of electrons of the bonding (σ and π) and anti-bonding (σ^* and π^*) molecular orbitals. For a bond to have been formed, the bond order should be greater than zero. The greater the bond order, the shorter is the bond distance and the greater is the bond dissociation energy. But if the bond order is the same in two cases, the bond distance will be greater and the bond dissociation energy smaller in the case which has more populated anti-bonding orbitals. The presence of unpaired electron(s) in a molecular orbital will make the system paramagnetic.

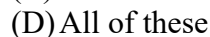
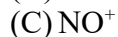
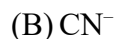
28. Which of the following species is not expected to exist?



KEY: C

HINT:

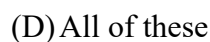
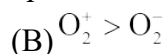
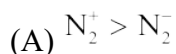
29. Which among the following will have a triple bond order?



KEY: D

HINT:

30. Which of the following orders is correct in respect of bond dissociation energy?



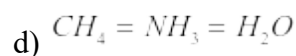
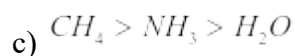
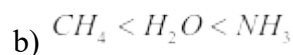
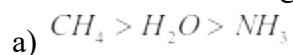
KEY: B

HINT:

Passage - 11

According to VSEPR theory, the shape of molecules depends on the number of valence electrons in the central atom. The repulsion between $l.p-l.p > l.p-b.p > b.p-b.p$

31. Correct order of bond angle is



KEY: C

HINT: CH_4 (no l.p) NH_3 (1 l.p) H_2O (2 l.p)

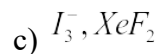
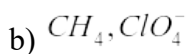
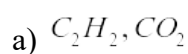
32. The shape of AB_2 type of molecule with 3 lone pairs on 'A' is

- a) Angular b) linear c) pentagonal bipyramidal d) trigonal bipyramidal

KEY: B

HINT:

33. Pair of molecules with similar shapes are



d) all the above

KEY: D

HINT:

Passage - 12

When two oppositely charged ions of unequal size approach each other closely, the smaller sized cation attract the outermost electrons of the other ion and repel the nuclear charge. The ability of a cation to polarise the nearby anion is called its polarizing power

34. Pair of ions with more polarization is

- a) $\text{Na}^+ \text{Cl}^-$ b) $\text{Na}^+ \text{F}^-$ c) $\text{Mg}^{+2} \text{F}^-$ d) $\text{Mg}^{+2} \text{Cl}^-$

KEY: D

HINT: More charge and lesser size of Mg^{+2}

35. Correct order of M.P is

- a) $\text{BeCl}_2 < \text{MgCl}_2 < \text{CaCl}_2 < \text{SrCl}_2$ b) $\text{CaI}_2 < \text{CaBr}_2 < \text{CaCl}_2 < \text{CaF}_2$
c) $\text{CuCl} < \text{NaCl}$ d) all the above

KEY: D

HINT:

36. Among the following more covalent character is for

- a) CaCl_2 b) CaF_2 c) MgCl_2 d) MgI_2

KEY: D

HINT:

1. According to MO theory which of the list ranks the oxygen species in terms of increasing Bond order $O_2, O_2^+, O_2^-, O_2^{2-}$

A) $O_2^{2-}, O_2^-, O_2^+, O_2$ B) $O_2^+, O_2, O_2^-, O_2^{2-}$ C) $O_2, O_2^+, O_2^-, O_2^{2-}$ D) $O_2^{2-}, O_2^-, O_2, O_2^+$

KEY: D

HINT: $O_2 = 2, O_2^+ = 2.5$

$$O_2^- = 1.5, O_2^{2-} = 1$$

2. In the compounds of the type ECl_3 where $E = B, P, As \text{ (or) } Bi$ the angles $Cl-E-Cl$ for different elements E are in the order

A) $B > P = As = Bi$ B) $B > P > As > Bi$ C) $B < P = As = Bi$ D) $B < P < As < Bi$

KEY: B

HINT: Conceptual

3. Valence shell electron pair repulsion theory can not explain the structure of following compounds

(A) CH_4 and NH_3 (B) PI_3 and PBr_3
(C) H_2O and Li_2O (D) Li_2O only

KEY: D

HINT: VSEPR theory can not explain the shapes of molecules which have very polar bonds (the structure of Li_2O is linear)

4. Shape and hybridization in $[IBrCl]^-$ ion is

(A) angular sp^2 (B) square planar, dsp^2
(C) linear, sp^3d (D) triangular bipyramidal, sp^3d .

KEY: C

HINT: $[IBrCl]^-$ is sp^3d hybridized with linear shape.

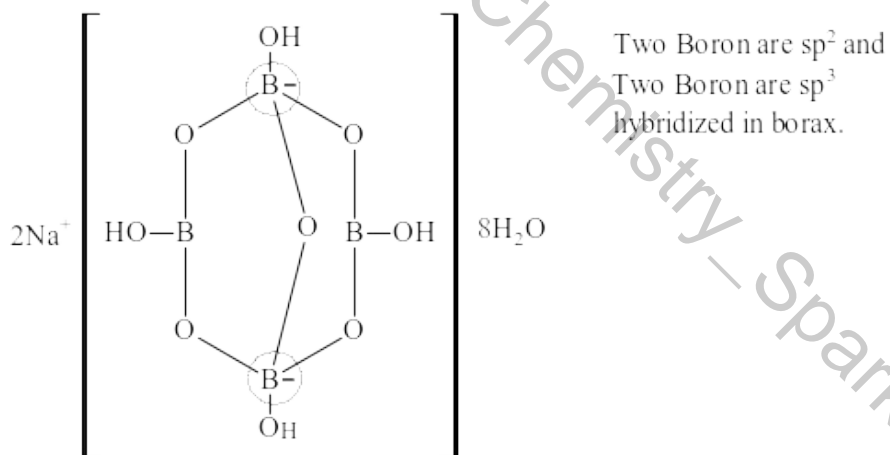
5. In diamond carbon – carbon bond length is 1.54\AA . In Graphite C—C (Carbon — Carbon) bond length is
- (A) 1.54\AA (B) 1.58\AA
 (C) 1.15\AA (D) 1.42\AA .

KEY: D

HINT: In graphite each carbon is left with one spare electron in its p orbital. This electron then overlaps with each other to form a π bond. Hence C—C distance in graphite is shorter (1.42\AA) than that of diamond (1.54\AA).

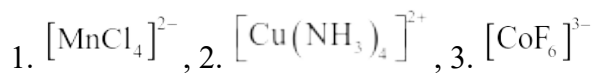
6. What type of hybridization is /are present in boron element in borax ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$).
- (A) sp^2 only (B) sp^2, sp^3
 (C) sp^3 only (D) $\text{dsp}^2, \text{sp}^3$.

KEY: B



HINT: Structure of Borax

7. Which statement is true for the following complex?



- (A) 1, 2, 3 complexes are paramagnetic with $\text{sp}^3, \text{sp}^3, \text{sp}^3\text{d}^2$ hybridization
 (B) 1, 2, 3 complexes are paramagnetic with $\text{sp}^3, \text{dsp}^2, \text{sp}^3\text{d}^2$ hybridization

(C) 1, 2 complexes are paramagnetic, 3 complex is diamagnetic with sp^3 , sp^3 , sp^3d^2 , in 1, 2, 3 complex respectively.

(D) 1, 3 are paramagnetic, 2 complex is diamagnetic with sp^3 , sp^3 , sp^3d^2 hybridization in 1, 2, 3 complex respectively.

KEY: B

HINT: 1. $[\text{MnCl}_4]^{2-}$ paramagnetic (5 unpaired e^-), sp^3

2. $[\text{Cu}(\text{NH}_3)_4]^{2+}$ paramagnetic (1 unpaired e^-), dsp^2

3. $[\text{CoF}_6]^{3-}$ paramagnetic (4 unpaired e^-), sp^3d^2 .

8 Which of the following molecules has non-zero dipole moment?

A) ClF_3O_2

B) XeO_3F_2

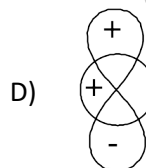
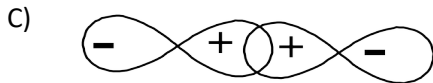
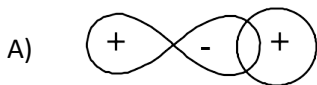
C) $(\text{CH}_3)_3\text{P}(\text{CCl}_3)_2$

D) $(\text{SiH}_3)_3\text{N}$

KEY: A

HINT: Conceptual

9 In which of the following does the overlap of two orbitals give a non bonding interaction?



KEY: D

HINT: Conceptual



10. I II III The correct increasing order of extent of π -bonding in above molecules are

(A) $I < II < III$

(B) $III < II < I$

(C) $III < I < II$

(D) $II < III < I$

KEY: C

HINT: Extent of π bonding increases with increases the electronegativity.

11. Which is the correct order of solubility in water?

(A) $CsF > CsCl > CsBr > CsI$

(B) $LiF > LiCl > LiBr > LiI$

(C) $RbClO_4 > KClO_4 > NaClO_4 > LiClO_4$

(D) $LiF > NaF > KF > RbF$

KEY: A

HINT: If the difference in size of cation and anion is large then hydration energy will be dominant.

12. The Shape of SF_2Cl_2 molecule is

(A) trigonal bipyramidal

(B) Square planar

(C) Sea-saw

(D) tetrahedral

KEY: C

13. In solid, each NH_3 molecule has 6 other NH_3 molecules as nearest neighbours. ΔH of sublimation of NH_3 at the melting point is 30.8 kJ/mole and the estimated ΔH of sublimation in the absence of hydrogen bonding is 14.4 kJ per mole. The strength of hydrogen bond in solid NH_3 is

(A) 5.5 kJ/mole

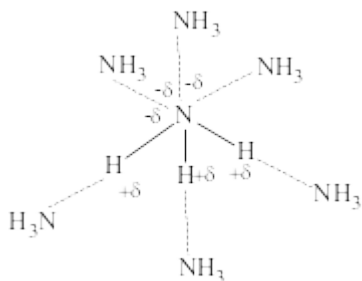
(B) 16.4 kJ/mole

(C) 2.7 kJ/mole

(D) -8.7 kJ/mole

Key: C

Hint: There are six hydrogen bond with one molecule of solid NH_3 .



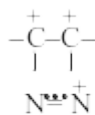
The energy of H-bond = $30.8 - 14.4 = 16.4$ kJ

$$\therefore \text{The strength of H-bond} = \frac{16.4}{6} \approx 2.7 \text{ kJ/mole}$$

14. Which of the following will have maximum dipole moment?

- (A) C_2^{2+} (B) N_2
(C) N_2^+ (D) O_2^+

Key: C



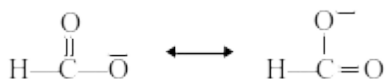
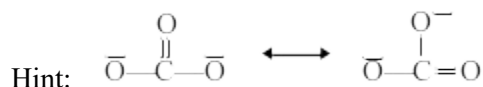
Hint: Bond order = 2.5 Bond order = 2.5

Since in N_2^+ , nitrogen is less electronegative than oxygen, hence bond length in N_2^+ is greater than O_2^+ , hence greater dipole moment.

15. Which of the following statements is correct?

- (A) All C—O bonds in CO_3^{2-} are equal but not in H_2CO_3
(B) All C—O bonds in HCO_2H are equal but not in HCO_2^-
(C) C—O bond length in HCO_2^- is longer than C—O bond length in CO_3^{2-}
(D) C—O bond length in HCO_2^- and C—O bond length in CO_3^{2-} are equal.

Key: A



C—O bond length in CO_3^{2-} and HCO_2^- are not equal since bond order in CO_3^{2-} is equal to 1.33 and in HCO_2^- is equal to 1.5.

16. N_2 and O_2 are converted to mono cations N_2^+ and O_2^+ respectively. The wrong statement with respect to given changes in the following is

- a) The N-N bond weakens
b) The O-O bond order increases
c) The magnetic moment decreases
d) N_2^+ becomes diamagnetic

KEY: D

HINT: M.O .configuration of

$$\text{N}_2 = \sigma_{1s}^2 \sigma_{1s}^{*2} \sigma_{2s}^2 \sigma_{2s}^{*2} \left[\begin{array}{c} \pi 2p_x^2 \\ \pi 2p_y^2 \end{array} \right] \sigma_{2p_z}^2$$

$$\therefore \text{Bond order} = \frac{1}{2} [10 - 4] = 3$$

$$\text{N}_2^+ = \sigma_{1s}^2 \sigma_{1s}^{*2} \sigma_{2s}^2 \sigma_{2s}^{*2} \left[\begin{array}{c} \pi 2p_x^2 \\ \pi 2p_y^2 \end{array} \right] \sigma_{2p_z}^1$$

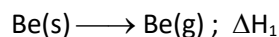
$$\therefore \text{Bond order} = \frac{1}{2} [9 - 4] = 2.5$$

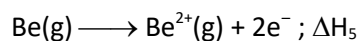
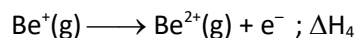
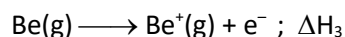
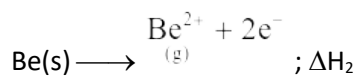
$$\text{O}_2 = \sigma_{1s}^2 \sigma_{1s}^{*2} \sigma_{2s}^2 \sigma_{2s}^{*2} \sigma_{2p_z}^2 \left[\begin{array}{c} \pi 2p_x^2 \\ \pi 2p_y^2 \end{array} \right] \left[\begin{array}{c} \pi^* 2p_x^1 \\ \pi^* 2p_y^1 \end{array} \right]$$

$$\text{O}_2^+ = \sigma_{1s}^2 \sigma_{1s}^{*2} \sigma_{2s}^2 \sigma_{2s}^{*2} \sigma_{2p_z}^2 \left[\begin{array}{c} \pi 2p_x^2 \\ \pi 2p_y^2 \end{array} \right] \left[\pi^* 2p_x^1 \right]$$

$$\therefore \text{Bond order of } \text{O}_2 = 2 \text{ and that of } \text{O}_2^+ = 2.5$$

17. Consider the following changes for Beryllium





The second ionization enthalpy could be calculated from the ΔH values as

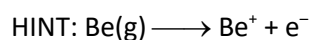
(A) $\Delta H_1 + \Delta H_3 + \Delta H_4$

(B) $\Delta H_2 - \Delta H_1 + \Delta H_3$

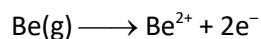
(C) $\Delta H_1 + \Delta H_5$

(D) $\Delta H_5 - \Delta H_3$

KEY: D

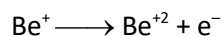


ΔH_3

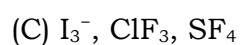
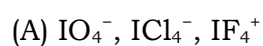


ΔH_5

$\Delta H_5 - \Delta H_3$ is for



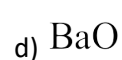
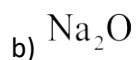
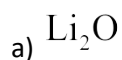
18. In which of the following sets central atom of each molecule is sp^3d hybridized?



KEY: C

HINT: The central atoms in all I_3^{-} , ClF_3 & SF_4 have five pairs (lp + bp) of electrons and hence are sp^3d hybridized.

19. Which of the following has maximum lattice energy?



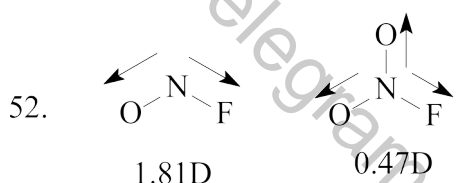
KEY: C

HINT: MgO , Mg^{+2} ion is smallest in size and double the charge in comparison to Li^{+} and Na^{+} ions

20. For which of the two compounds NOF , NO_2F . One has a resultant dipole moment of $M = 1.81D$ and the other $M = 0.47D$. Which dipole moment do you predict?

- A) $1.81D$ for NO_2F and $0.47D$ for NOF
 B) $0.47D$ for NO_2F and $1.81D$ for NOF
 C) For both NO_2F and NOF dipole moment is $0.47D$
 D) For both NO_2F and NOF dipole moment is $1.81D$

KEY: B



21. The correct order of increasing C O bond strength of CO , CO_3^{2-} , CO_2 is:
- a) $CO_3^{2-} < CO_2 < CO$ b) $CO_2 < CO_3^{2-} < CO$
 c) $CO < CO_3^{2-} < CO_2$ d) $CO < CO_2 < CO_3^{2-}$

KEY: A

22. The solubilities of sulphates of alkaline earth metals decrease down the group mainly due to decrease in

- (A) Lattice energy of metal sulphate (B) Entropy of solution of metal sulphates
 (C) Interionic attraction (D) Hydration energy of cations

KEY: D

HINT: r_- = radius of anion

r_+ = radius of cation

$$\text{Lattice energy} \propto \frac{1}{(r_+ + r_-)^2} \approx \frac{1}{r_-^2}, \text{ as } r_- \gg r_+$$

SO_4^{2-} ion being common so lattice energy remains almost the same.

$$\text{Hydration energy} \propto \frac{1}{r_+^2} + \frac{1}{r_-^2} \approx \frac{1}{r_+^2}$$

23. XeF_6 is:

- (A) Octahedral (B) Pentagonal pyramidal
(C) Planar (D) tetrahedral

KEY: B

24. Dipole moment is exhibited by:

- (A) 1, 4-dichlorobenzene (B) 1, 2-dichlorobenzene
(C) Trans-1, 2-dichloroethene (D) Trans-1, 2-dichloro-2-butene

KEY: B

25. Which of the following are isoelectronic and isostructural? NO_3^- , CO_3^{2-} , SO_3

- (A) NO_3^- , CO_3^{2-} (B) SO_3 , NO_3^-
(C) ClO_3^- , CO_3^{2-} (D) CO_3^{2-} , SO_3

KEY: A

HINT:

26. According to molecular orbital theory which of the following statement about the magnetic character and bond order is correct regarding O_2^+

- (A) Paramagnetic and Bond order $< \text{O}_2$
(B) Paramagnetic and Bond order $> \text{O}_2$
(C) Diamagnetic and Bond order $< \text{O}_2$
(D) Diamagnetic and Bond order $> \text{O}_2$

KEY: B

HINT:

27. The number and type of bonds between two carbon atoms in CaC_2 are:

- (A) one sigma (σ) and one pi (π) bonds
(B) one sigma (σ) and two pi (π) bonds
(C) one sigma (σ) and one and a half pi (π) bonds

(D) one sigma (σ) bond

KEY: B

HINT:

28. Among KO_2 , AlO_2^- , BaO_2 and NO_2^+ , unpaired electron is present in

(A) NO_2^+ and BaO_2

(B) KO_2 and AlO_2^-

(C) KO_2 only

(D) BaO_2 only

KEY: C

HINT:

29. Molecular shapes of SF_6 , CF_4 and XeF_6 are

(A) the same with 2, 0 and 1 lone pairs of electrons respectively

(B) the same, with 1, 1 and 1 lone pairs of electrons respectively

(C) different, with 0, 1 and 2 lone pairs of electrons respectively

(D) different, with 0, 0 and 1 lone pairs of electrons respectively

KEY: D

HINT:

30. Which of the following has maximum hydration energy

a) x^+

b) x^{++}

c) x^{+++}

d) x^{++++}

KEY: D

HINT: Small ions are more hydrated. Greater the positive charge smaller the size

31. The hybridisation of central atom in PCl_5 is

a) sp^3

b) sp^3d

c) sp^3d^2

d) sp^2

KEY: B

HINT:

47. Incorrect bond order is

a) $O_2^{-2} > O_2^- > O_2 > O_2^+$

b) $N_{2-} > N_{2-2} < N_2$

c) $NO^+ > NO > N_2^{-2}$

d) $CN^- > NO^- > O_3$

KEY: A

HINT:
$$\frac{N_b - N_a}{2}$$

32. The number of covalent bonds formed by the overlapping of pure orbitals in one calcium carbide is / are

- a) 4 b) 3 c) 2 d) 1

KEY: C

HINT: $Ca^{+2} \quad \bar{C} \equiv \bar{C} \quad 1\sigma, 2\pi$

05. Which of the following is diamagnetic in nature

- A) He_2^+ B) H_2 C) H_2^+ D) H_2^-

KEY: B

6. Hydrated aluminium chloride is ionic compound and soluble in water giving

- a) Al^{3+} and Cl^- ions b) $[Al(H_2O)_6]^{3+}$ and Cl^- ions
c) $[AlCl_2(H_2O)_4]^+$ and $[AlCl_4(H_2O)_2]^-$ ions d) none of these

KEY: C

HINT:

7. Alumina is insoluble in water because

- a) it is a covalent compound
b) it has high lattice energy and low heat of hydration
c) it has low lattice energy and high heat of hydration
d) Al^{3+} and O^{2-} ions are not excessively hydrated

KEY: B

HINT:

8. Borax in its crystal possess

- a) 3 tetrahedral unit
b) 2 tetrahedral and 2 planar triangular units
c) 3 tetrahedral and 2 planar triangular units
d) all tetrahedral units

KEY: B

HINT:

9. In which C-H bond length is more

- a) C_2H_6 b) C_2H_4 c) C_2H_2 d) can not be determined

KEY: C

HINT: C_2H_2 carbon is sp -hybridized.

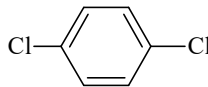
10. Among the following which is polar

a) CO_2

b) SO_2

c) $BeCl_2$

d)



KEY: B

HINT: SO_2 is a bent molecule has net dipole moment.

11. Which of the following is not diamagnetic?

a) C_2

b) O_2^{2-}

c) Li_2

d) N_2^+

KEY: D

HINT: N_2^+ there is one unpaired electron present in bonding molecular orbital.

12. Maximum number of H-bonds that can be formed by a water molecule is –

a) 2

b) 3

c) 4

d) 6

KEY: C

HINT: Each water molecule surrounded by 4 other water molecules which are bonded by Hydrogen bonds.

1. The hybridization of nitrogen in NO_2^+ , NO_3^- and NH_4^+ are :

a) sp , sp^3 and sp^2 respectively

b) sp , sp^2 , and sp^3 respectively

c) sp^2 , sp , and sp^3 respectively

d) sp^2 , sp^3 and sp respectively

KEY: B

HINT:

2. Which species has the maximum number of lone pairs of electrons on the central atom ?

a) $XeOF_4$

b) IF_4^+

c) XeF_2

d) BrF_3

KEY: C

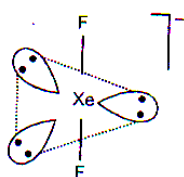
HINT: (C) According to VSEPR theory

Number of electron pairs = 5

Number of bond pairs = 2

Number of lone pairs = 3

Hence structure is linear



hybridization = sp^3d .

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- Nature of the bond formed between two elements depends on the
(a) Oxidation potential (b) Electronegativity
(c) Ionization potential (d) Electron affinity
- Two elements X and Y have following electronic configurations $X = 1s^2, 2s^2 2p^6, 3s^2 3p^6, 4s^2$ and $Y = 1s^2, 2s^2 2p^6, 3s^2 3p^5$. The expected compound formed by combination of X and Y is [BHU 1990]
(a) XY_2 (b) X_5Y_2
(c) X_2Y_5 (d) XY_5
- Electricity do not pass through ionic compounds
(a) In solution (b) In solid state
(c) In melted state (d) None of these
- From the following which compound on heating readily sublimes
(a) $NaCl$ (b) $MgCl_2$
(c) $BaCl_2$ (d) $AlCl_3$
- Which one in the following contains ionic as well as covalent bond [IIT 1979; CPMT 1983; DPMT 1983]
(a) CH_4 (b) H_2
(c) KCN (d) KCl
- The solution of sugar in water contains [NCERT 1972; MP PET 2000]
(a) Free atoms
(b) Free molecules
(c) Free ions
(d) Free atoms and free molecules
- In which of the following reactions, there is no change in the valency [NCERT 1974; CPMT 1971, 78]
(a) $4KClO_3 \rightarrow 3KClO_4 + KCl$
(b) $SO_2 + 2H_2S \rightarrow 2H_2O + 3S$
(c) $BaO_2 + H_2SO_4 \rightarrow BaSO_4 + H_2O_2$
(d) $2BaO + O_2 \rightarrow 2BaO_2$
- The octet rule is not followed in [BHU 1981]
(a) F_2 (b) NaF
(c) CaF_2 (d) BF_3
- Sodium chloride is an ionic compound whereas hydrogen chloride is a gas because [KCET 2002]
(a) Sodium is reactive
(b) Covalent bond is weaker than ionic bond
(c) Hydrogen chloride is a gas
(d) Covalent bond is stronger than ionic bond
- Which one of the following molecules has a coordinate bond [CPMT 1988, 94]
(a) NH_4Cl (b) $AlCl_3$
(c) $NaCl$ (d) Cl_2
- Co-ordinate bond is absent in [RPMT 2002]
(a) BH_4^- (b) CO_3^{2-}
(c) H_3O^+ (d) NH_4^+
- The dipole moment of chlorobenzene is 1.73 D. The dipole moment of p -dichlorobenzene is expected to be [CPMT 1991]
(a) 3.46 D (b) 0.00 D
(c) 1.73 D (d) 1.00 D
- Polarization of electrons in acrolein may be written as [IIT 1988]
(a) $\overset{\delta^-}{C}H_2 = \overset{\delta^+}{CH} - \overset{\delta^-}{C}H = O$ (b) $\overset{\delta^-}{C}H_2 = CH - \overset{\delta^+}{CH} = O$
(c) $\overset{\delta^-}{C}H_2 = \overset{\delta^+}{CH} - CH = O$ (d) $\overset{\delta^+}{C}H_2 = CH - CH = \overset{\delta^-}{O}$
- The order of dipole moments of the following molecules is [Roorkee 2000]
(a) $CHCl_3 > CH_2Cl_2 > CH_3Cl > CCl_4$
(b) $CH_2Cl_2 > CH_3Cl > CHCl_3 > CCl_4$
(c) $CH_3Cl > CH_2Cl_2 > CHCl_3 > CCl_4$
(d) $CH_2Cl_2 > CHCl_3 > CH_3Cl > CCl_4$
- The electronegativity of C, H, O, N and S are 2.5, 2.1, 3.5, 3.0 and 2.5 respectively. Which of the

following bond is most polar

[EAMCET 1986]

- (a) $O-H$ (b) $S-H$
(c) $N-H$ (d) $C-H$

16. Which of the following bond has the most polar character

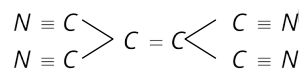
[DPMT 1982; CBSE PMT 1992; CPMT 1999]

- (a) $C-O$ (b) $C-Br$
(c) $C-S$ (d) $C-F$

17. The geometry of H_2S and its dipole moment are [IIT 1999]

- (a) Angular and non-zero (b) Angular and zero
(c) Linear and non-zero (d) Linear and zero

18. How many σ and π bonds are there in the molecule of tetracyanoethylene



[NCERT 1980; MP PMT 1986, 95; Orissa JEE 1997]

- (a) Nine σ and nine π (b) Five σ and nine π
(c) Nine σ and seven π (d) Five σ and eight π

19. The shape of H_3O^+ ion is [EAMCET 1993; CPMT 2001]

- (a) Linear (b) Angular
(c) Trigonal planar (d) Triangular pyramidal

20. The hybridization in sulphur dioxide is [IIT 1986; DPMT 1990]

- (a) sp (b) sp^3
(c) sp^2 (d) dsp^2

21. The number and type of bonds between two carbon atoms in C_2 are [IIT 1996]

- (a) One sigma (σ) and one pi (π) bonds
(b) One sigma (σ) and two pi (π) bonds
(c) One sigma (σ) and one and a half pi (π) bonds
(d) One sigma (σ) bond

22. Which of the following resonating structures of N_2O is the most contributing [Roorkee Qualifying 1998]

- (a) $N \equiv N-O$ (b) $N-N \equiv O$
(c) $N=N-O$ (d) $N-N=O$

23. The hybridization of atomic orbitals of nitrogen in NO_2^+ , NO_3^- , and NH_4^+ are

[IIT Screening 2000]

- (a) sp , sp^3 and sp^2 respectively
(b) sp , sp^2 and sp^3 respectively
(c) sp^2 , sp and sp^3 respectively

- (d) sp^2 , sp^3 and sp respectively

24. The molecule having one unpaired electron is

[IIT 1985; MP PMT 1989]

- (a) NO (b) CO
(c) CN^- (d) O_2

25. The geometry of ClO_3^- , according to valence shell electron pair repulsion (VSEPR) theory will be

[KCET 1996; MP PET 1997]

- (a) Planar triangle (b) Pyramidal
(c) Tetrahedral (d) Square planar

26. Which of the following halogens has the highest bond energy [CPMT 1988]

- (a) F_2 (b) Cl_2
(c) Br_2 (d) I_2

27. What bond order does O_2^{2-} have [Pb. PMT 2001]

- (a) 3 (b) 2
(c) 1 (d) $1/2$

28. In the process, $O_2^+ \rightarrow O_2^{+2} + e$ the electron lost is from

[Orissa JEE 2002]

- (a) Bonding π -orbital (b) Antibonding π -orbital
(c) $2p_z$ orbital (d) $2p_x$ orbital

29. The maximum number of hydrogen bonds formed by a water molecule in ice is

[MP PET 1993; AFMC 2002; UPSEAT 1999, 2001, 02]

- (a) 4 (b) 3
(c) 2 (d) 1

30. Hydrogen bonding is not present in

[AIIMS 1998; MP PET/PMT 1998]

- (a) Glycerine
(b) Water
(c) Hydrogen sulphide
(d) Hydrogen fluoride

31. The bonds in $K_4[Fe(CN)_6]$ are

[EAMCET 1991]

- (a) All ionic
(b) All covalent
(c) Ionic and covalent
(d) Ionic, covalent and coordinate covalent

32. In which of the following ionic, covalent and coordinate bonds are present

[UPSEAT 2002]

- (a) Water
(b) Ammonia

(c) Sodium cyanide

(d) Potassium bromide

Answers and Solutions

(SET -3)

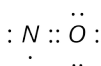
1. (b) If the two elements have similar electronegativities, the bond between them will be covalent, while a large difference in electronegativities leads to an ionic bond.
2. (a) From electronic configuration valencies of X and Y are +2 and -1 respectively so formula of compound is XY_2 .
3. (b) Ionic compounds can't pass electricity in solid state because they don't have mobile ion in solid state.
4. (d) $AlCl_3$ sublimes readily on heating.
5. (c) Structure of KCN is $[K^+(C \equiv \ddot{N})]^-$.
6. (b) Sugar is an organic compound which is covalently bonded so in water it remains as free molecules.
7. (c) In the reaction $BaO_2 + H_2SO_4 \rightarrow BaSO_4 + H_2O$ valency is not changing.
8. (d) BF_3 does not have octet, it has only six electrons so it is electron deficient compound.
9. (b) $NaCl$ is an ionic compound because it consists of more electronegativity difference compared to HCl .
10. (a) NH_4Cl has a coordinate bond besides covalent and ionic bonds $\left[\begin{array}{c} H \\ | \\ H - N \rightarrow H \\ | \\ H \end{array} \right]^+ Cl^-$
11. (b) $\begin{array}{c} O^- \\ | \\ -O - C = O \end{array}$ has covalent bonds only.
12. (b) Due to symmetry dipole moment of *p*-dichloro benzene is zero.
13. (d)
14. (d) CCl_4 has zero dipole moment because of symmetric tetrahedral structure. CH_3Cl has slightly higher dipole moment which is equal to $1.86D$. Now CH_3Cl has less electronegativity than CH_2Cl_2 . But CH_2Cl_2 has greater dipole moment than $CHCl_3$.
15. (a) More the difference in electronegativity of atoms. Bond between them will be more polar.
16. (d) $C - F$ bond has the most polar character due to difference of their electronegativity.
17. (a) H_2S has angular geometry and has some value of dipole moment.
18. (a) $N \equiv C \equiv N$ $\begin{array}{c} \pi \\ \sigma \end{array}$ $\begin{array}{c} \pi \\ \sigma \end{array}$ $C \equiv N$
 $N \equiv C \equiv N$ $\begin{array}{c} \sigma \\ \pi \end{array}$ $\begin{array}{c} \sigma \\ \pi \end{array}$ $C \equiv N$
9 π and 9 σ bonds.
19. (d) H_3O^+ has sp^3 hybridization and its shape is triangular pyramidal due to lone pair on oxygen.
20. (c) SO_2 molecule has sp^2 hybridisation.

21. (b) In $\begin{array}{c} \text{C} \\ \diagdown \\ \text{|||} \\ \text{C} \end{array} \text{Ca}$ two carbons are joined with 1σ and 2π bonds.

22. (a) In N_2O molecule $N \equiv N - O$ structure is most contributed.

23. (b) The shape of NO_2^+ , NO_3^- and NH_4^+ are linear trigonal planar and tetrahedral respectively. Thus the hybridization of atomic orbitals of nitrogen in these species are sp , sp^2 and sp^3 respectively.

24. (a) NO has one unpaired electron with Nitrogen.



25. (b) $\begin{array}{c} \text{O} \\ | \\ \text{O} - \text{Cl} - \text{O} \\ | \\ \text{O} \end{array}$

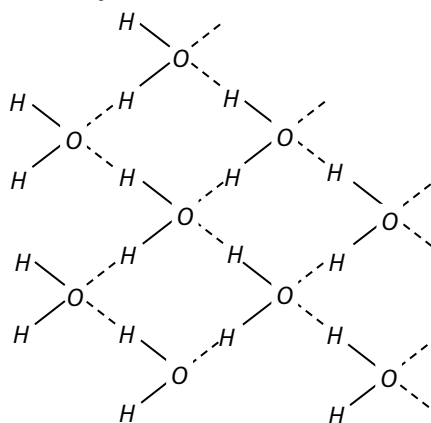
26. (b) Bond energy of Cl_2 is highest among all halogen molecule. Bond energies of F_2 , Cl_2 , Br_2 , I_2 are 37, 58, 46 and 36 $Kcal\ mol^{-1}$ respectively.

27. (c) O_2^{2-} have bond order one

$$B.O. = \frac{1}{2}[10 - 8] = \frac{2}{2} = 1.$$

28. (b) Electron lost from antibonding π orbital.

29. (a) In ice each water molecule forms four hydrogen bond through which each water molecule is tetrahedrally attached with other water molecule.

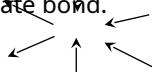


30. (c) Hydrogen bonding is present in molecules which have F , O , or N atoms.

31. (d) Structure of $K_4[Fe(CN)_6]$ is



32. (c) Sodium cyanide contain ionic, covalent and coordinate bond.



4. Chapter

Halo-Alkanes And Halo-Arenes

Telegram @Chemistry_Spark

Ordinary Thinking

Objective Questions

Introduction of Halogen containing compounds

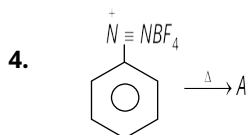
- How many structural isomers are possible for a compound with molecular formula C_3H_7Cl [MH CET 2001]
 - 2
 - 5
 - 7
 - 9
- In CH_3CH_2Br , % of Br is [DPMT 1996]
 - 80
 - 75
 - 70
 - 7
- Gem- dibromide is [RPMT 2000]
 - $CH_3CH(Br)OH(Br)CH_3$
 - $CH_3CBr_2CH_3$
 - $CH_2(Br)CH_2CH_2$
 - CH_2BrCH_2Br
- Ethylidene dibromide is
 - $CH_3 - CH_2 - Br$
 - $Br - CH_2 - CH_2 - Br$
 - $CH_3 - CHBr_2$
 - $CH_2 = CBr_2$
- Benzylidene chloride is
 - $C_6H_5CH_2Cl$
 - $C_6H_5CHCl_2$
 - $C_6H_4ClCH_2Cl$
 - $C_6H_5CCl_3$
- Which of the following halide is 2°
 - Isopropyl chloride
 - Isobutyl chloride
 - n*-propyl chloride
 - n*-butyl chloride
- Haloforms are trihalogen derivatives of [CPMT 1985]
 - Ethane
 - Methane
 - Propane
 - Benzene
- Benzene hexachloride is
 - 1, 2, 3, 4, 5, 6-hexachlorocyclohexane
 - 1, 1, 1, 6, 6, 6-hexachlorocyclohexane
 - 1, 6-phenyl-1, 6-chlorohexane
 - 1, 1-phenyl-6, 6-chlorohexane
- Number of π - bonds present in B.H.C. (Benzene hexachloride) are [RPMT 1999]
 - 6
 - Zero
 - 3
 - 12
- The general formula for alkyl halides is
 - $C_nH_{2n+1}X$
 - $C_nH_{2n+2}X$
 - $C_nH_{n+1}X$
 - $C_nH_{2n}X$

- Which of the following is a primary halide [DCE 2004]
 - Isopropyl iodide
 - Secondary butyl iodide
 - Tertiary butyl bromide
 - Neo hexyl chloride
- Full name of DDT is [KCET 1993]
 - 1, 1, 1-trichloro-2, 2-bis(*p*-chlorophenyl) ethane
 - 1, 1-dichloro-2, 2-diphenyl trimethylethane
 - 1, 1-dichloro-2, 2-diphenyl trichloroethane
 - None of these
- The compound which contains all the four $1^\circ, 2^\circ, 3^\circ$ and 4° carbon atoms is [J & K 2005]
 - 2, 3-dimethyl pentane
 - 3-chloro-2, 3-dimethylpentane
 - 2, 3, 4-trimethylpentane
 - 3, 3-dimethylpentane

Preparation of Halogen containing compounds

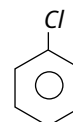
- The following reaction is known as

$$C_2H_5OH + SOCl_2 \xrightarrow{\text{Pyridine}} C_2H_5Cl + SO_2 + HCl$$
 [AIIMS 2002]
 - Kharasch effect
 - Darzen's procedure
 - Williamson's synthesis
 - Hunsdiecker synthesis reaction
- What is the main product of the reaction between 2-methyl propene with HBr [RPMT 2002]
 - 1-bromo butane
 - 1-bromo-2 methyl propane
 - 2-bromo butane
 - 2-bromo-2 methyl propane
- Halogenation of alkanes is [KCET 2002]
 - A reductive process
 - An oxidative process
 - An isothermal process
 - An endothermic process



In the above process product A is [Kerala (Engg.) 2002]

- Fluorobenzene
 - Benzene
 - 1, 4-difluorobenzene
 - 1, 3-difluorobenzene
- Silver acetate + $Br_2 \xrightarrow{CS_2}$. The main product of this reaction is [Kurukshetra CET 2002]
 - $CH_3 - Br$
 - CH_3COI
 - CH_3COOH
 - None of these



6. Diazonium salts + $Cu_2Cl_2 + HCl \rightarrow$, the reaction is known as [Kerala (Med.) 2002]

- (a) Chlorination (b) Sandmeyer's reaction
(c) Perkin reaction (d) Substitution reaction

7. When ethyl alcohol (C_2H_5OH) reacts with thionyl chloride, in the presence of pyridine, the product obtained is [AIIMS; CBSE PMT 2001]

- (a) $CH_3CH_2Cl + HCl$
(b) $C_2H_5Cl + HCl + SO_2$
(c) $CH_3CH_2Cl + H_2O + SO_2$
(d) $CH_3CH_2Cl + HCl + SO_2$

8. Preparation of alkyl halides in laboratory is least preferred by [DPMT 2000]

- (a) Treatment of alcohols
(b) Addition of hydrogen halides to alkenes
(c) Halide exchange
(d) Direct halogenation of alkanes

9. Which of the following organic compounds will give a mixture of 1-chlorobutane and 2-chlorobutane on chlorination [CPMT 2001]

- (a) $CH_3 - \underset{\substack{| \\ CH_3}}{CH} - CH = CH_2$
(b) $HC \equiv C - \overset{\substack{| \\ H}}{C} = CH_2$
(c) $CH_2 = CH - CH = CH_2$
(d) $CH_2 = CH - CH_2 - CH_3$

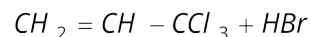
10. The chlorobenzene is generally obtained from a corresponding diazonium salt by reacting it with [MP PMT 2000]

- (a) Cu_2Cl_2 (b) $CuSO_4$
(c) Cu (d) $Cu(NH_3)_4^{2+}$

11. Decreasing order of reactivity of HX in the reaction $ROH + HX \rightarrow RX + H_2O$ [RPET 2000; AIIMS 1983; MP PET 1996]

- (a) $HI > HBr > HCl > HF$ (b) $HBr > HCl > HI > HF$
(c) $HCl > HBr > HI > HF$ (d) $HF > HBr > HCl > HI$

12. The product of the following reaction :



[RPET 2000]

- (a) $CH_3 - CH(Br) - CCl_3$ (b) $CH_2(Br) - CH_2 - CCl_3$
(c) $BrCH_2 - CHCl - CHCl_2$ (d) $CH_3 - CH_2 - CCl_3$

13. Chlorobenzene is prepared commercially by [JIPMER 2000; CPMT 1976; Pb. CET 2002]

- (a) Raschig process (b) Wurtz Fitting reaction
(c) Friedel-Craft's reaction (d) Grignard reaction

14. In methyl alcohol solution, bromine reacts with ethylene to yield $BrCH_2CH_2OCH_3$ in addition to 1, 2-dibromoethane because [Pb. PMT 1998]

- (a) The ion formed initially may react with Br^- or CH_3OH
(b) The methyl alcohol solvates the bromine
(c) The reaction follows Markownikoff's rule
(d) This is a free-radical mechanism

15. $C_3H_8 + Cl_2 \xrightarrow{\text{Light}} C_3H_7Cl + HCl$ is an example of which of the following types of reactions [AFMC 1997; CPMT 1999]

- (a) Substitution (b) Elimination
(c) Addition (d) Rearrangement

16. Which of the following would be produced when acetylene reacts with HCl [MH CET 1999]

- (a) CH_3CH_2Cl (b) CH_3CHCl_2
(c) $CHCl = CHCl$ (d) $CH_2 = CHCl$

17. $R-OH + HX \rightarrow R-X + H_2O$

In the above reaction, the reactivity of different alcohols is [CPMT 1997]

- (a) Tertiary > Secondary > Primary
(b) Tertiary < Secondary < Primary
(c) Tertiary < Secondary > Primary
(d) Secondary < Primary < Tertiary

18. $C_6H_6 + Cl_2 \xrightarrow{UV \text{ Light}}$ Product. In above reaction product is [CPMT 1997]

- (a) CCl_3CHO (b) $C_6H_6Cl_6$
(c) $C_6H_{12}Cl_6$ (d) $C_6H_9Cl_2$

19. Benzene reacts with chlorine to form benzene hexachloride in presence of [MP PET 1999]

- (a) Nickel (b) $AlCl_3$
(c) Bright sunlight (d) Zinc

20. The final product obtained by distilling ethyl alcohol with the excess of chlorine and $Ca(OH)_2$ is [MP PET 1996]

- (a) CH_3CHO (b) CCl_3CHO
(c) $CHCl_3$ (d) $(CH_3)_2O$

21. When ethyl alcohol and KI reacted in presence of Na_2CO_3 , yellow crystals of..... are formed [AFMC 1989]
 (a) CHI_3 (b) CH_3I
 (c) CH_2I_2 (d) C_2H_5I
22. In preparation of $CHCl_3$ from ethanol and bleaching powder, the latter provides [BHU 1986]
 (a) $Ca(OH)_2$ (b) Cl_2
 (c) Both (a) and (b) (d) None of these
23. Which one of the following processes does not occur during formation of $CHCl_3$ from C_2H_5OH and bleaching powder [DPMT 1984]
 (a) Hydrolysis (b) Oxidation
 (c) Reduction (d) Chlorination
24. Which of the following is obtained when chloral is boiled with $NaOH$ [CBSE PMT 1991; RPMT 1999]
 (a) CH_3Cl (b) $CHCl_3$
 (c) CCl_4 (d) None of these
25. Chloroform can be obtained from [MNR 1986]
 (a) Methanol (b) Methanal
 (c) Propanol-1 (d) Propanol-2
26. Chlorine reacts with ethanol to give [MP PMT 1989; CPMT 1997; KCET 1998; JIPMER 1999]
 (a) Ethyl chloride (b) Chloroform
 (c) Acetaldehyde (d) Chloral
27. On heating diethyl ether with conc. HI , 2 moles of which of the following is formed [IIT-JEE 1983; MP PET 1990; EAMCET 1990; AFMC 1993; JIPMER 2001]
 (a) Ethanol (b) Iodoform
 (c) Ethyl iodide (d) Methyl iodide
28. Lucas reagent is [MP PMT 1996; MP PET 1992, 95; CPMT 1986, 89; AIIMS 1980; Kurukshetra CEE 2002]
 (a) Concentrated HCl + anhydrous $ZnCl_2$
 (b) Dilute HCl + hydrated $ZnCl_2$
 (c) Concentrated HNO_3 + anhydrous $ZnCl_2$
 (d) Concentrated HCl + anhydrous $MgCl_2$
29. Which compound does not form iodoform with alkali and iodine [IIT-JEE 1985]
 (a) Acetone (b) Ethanol
 (c) Diethyl ketone (d) Isopropyl alcohol
30. Which compound gives yellow ppt. with iodine and alkali [IIT-JEE 1984]
 (a) 2-hydroxy propane (b) Acetophenone
 (c) Methyl acetone (d) Acetamide
31. Acetone reacts with I_2 in presence of $NaOH$ to form [MP PMT 1992]
 (a) C_2H_5I (b) $C_2H_4I_2$
 (c) CHI_3 (d) CH_3I
32. Ethanol is converted into ethyl chloride by reacting with [MP PET 1991; MP PMT 1990; BHU 1997]
 (a) Cl_2 (b) $SOCl_2$
 (c) HCl (d) $NaCl$
33. C_6H_5Cl prepared by aniline with [IIT-JEE 1984]
 (a) HCl
 (b) Cu_2Cl_2
 (c) Cl_2 in presence of anhydrous $AlCl_3$
 (d) HNO_2 and then heated with Cu_2Cl_2
34. The starting substance for the preparation of CH_3I is [CPMT 1975]
 (a) CH_3OH (b) C_2H_5OH
 (c) CH_3CHO (d) $(CH_3)_2CO$
35. A Grignard's reagent may be made by reacting magnesium with [CPMT 1973, 83, 84]
 (a) Methyl amine (b) Diethyl ether
 (c) Ethyl iodide (d) Ethyl alcohol
36. Which of the following is responsible for iodoform reaction [CPMT 1980; RPMT 1997]
 (a) Formalin (b) Methanol
 (c) Acetic acid (d) Ethanol
37. When a solution of sodium chloride containing ethyl alcohol is electrolysed, it forms
 (a) Ethyl alcohol (b) Chloral
 (c) Chloroform (d) Acetaldehyde
38. Which reagent cannot be used to prepare an alkyl halide from an alcohol [CPMT 1989, 94]
 (a) $HCl + ZnCl_2$ (b) $NaCl$
 (c) PCl_5 (d) $SOCl_2$
39. Ethyl benzoate reacts with PCl_5 to give [KCET 2003]
 (a) $C_2H_5Cl + C_6H_5COCl + POCl_3 + HCl$
 (b) $C_2H_5Cl + C_6H_5COCl + POCl_3$
 (c) $CH_3COCl + C_6H_5COCl + POCl_3$
 (d) $C_2H_5Cl + C_6H_5COOH + POCl_3$
40. On treatment with chlorine in presence of sunlight, toluene gives the product [Orissa JEE 2003; MH CET 1999, 2002]
 (a) o-chloro toluene (b) 2, 5-dichloro toluene
 (c) p-chloro toluene (d) Benzyl chloride

41. When chlorine is passed through warm benzene in presence of the sunlight, the product obtained is [KCET 2003]

- (a) Benzotrichloride (b) Chlorobenzene
(c) Gammexane (d) DDT

42. Which of the following acids adds to propene in the presence of peroxide to give anti-Markownikoff's product

[MP PET 2003]

- (a) HF (b) HCl
(c) HBr (d) HI

43. Propene on treatment with HBr gives [CPMT 1986]

- (a) Isopropyl bromide (b) Propyl bromide
(c) 1, 2-dibromoethane (d) None of the above

44. The catalyst used in Raschig's process is

- (a) $LiAlH_4$ (b) Copper chloride
(c) Sunlight (d) Ethanol/Na

45. The compound formed on heating chlorobenzene with chloral in the presence of concentrated sulphuric acid, is

[AIEEE 2004]

- (a) Freon (b) DDT
(c) Gammexane (d) Hexachloroethane

46. Acetone is mixed with bleaching powder to give

[AFMC 2004]

- (a) Chloroform (b) Acetaldehyde
(c) Ethanol (d) Phosgene

47. Which of the following compounds gives trichloromethane on distilling with bleaching powder

[KCET 2004; EAMCET 1986]

- (a) Methanal (b) Phenol
(c) Ethanol (d) Methanol

48. The product formed on reaction of ethyl alcohol with bleaching powder is [Orissa JEE 2004; DPMT 1978; AIIMS 1991]

- (a) $CHCl_3$ (b) CCl_3CHO
(c) CH_3COCH_3 (d) CH_3CHO

49. Ethylene reacts with bromine to form [Pb. CET 2000]

- (a) Chloroethane (b) Ethylene dibromide
(c) Cyclohexane (d) 1-bromo propane

50. Best method of preparing alkyl chloride is [MH CET 2004]

- (a) $ROH + SOCl_2 \longrightarrow$
(b) $ROH + PCl_5 \longrightarrow$
(c) $ROH + PCl_3 \longrightarrow$
(d) $ROH + HCl \xrightarrow{\text{anhy. ZnCl}_2}$

51. DDT is prepared by reacting chlorobenzene with

[BHU 1998, 2005]

- (a) CCl_4 (b) $CCl_3 - CHO$

- (c) $CHCl_3$ (d) Ethane

52. Which compound needs chloral in its synthesis

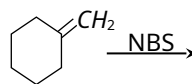
[Pb. PET 2003]

- (a) D. D. T. (b) Gammexane
(c) Chloroform (d) Michler's Ketone

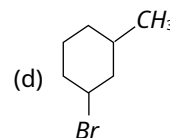
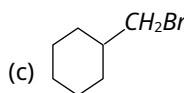
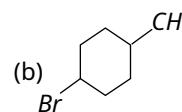
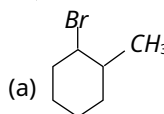
53. To get DDT, chlorobenzene has to react with which of the following compounds in the presence of concentrated sulphuric acid [KCET (Engg/Med.) 2001]

- (a) Trichloroethane (b) Dichloroacetone
(c) Dichloroacetaldehyde (d) Trichloroacetaldehyde

54. What will be the product in the following reaction



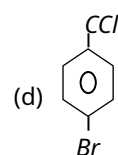
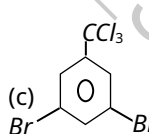
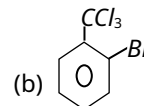
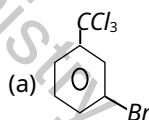
[BHU 2005]



Properties of Halogen containing compounds

1. A. Compound A is

[Orissa JEE 2005]



2. Ethyl bromide can be converted into ethyl alcohol by

[KCET 1989]

- (a) Heating with dilute hydrochloric acid and zinc
(b) Boiling with an alcoholic solution of KOH
(c) The action of moist silver oxide
(d) Refluxing methanol

3. Reaction of ethyl chloride with sodium leads to

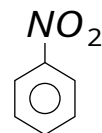
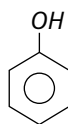
[NCERT 1984]

- (a) Ethane (b) Propane
(c) n-butane (d) n-pentane

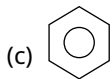
4. Treatment of ammonia with excess of ethyl chloride will yield [AIIMS 1992]

- (a) Diethyl amine
(b) Ethane
(c) Tetraethyl ammonium chloride
(d) Methyl amine
5. $2CHCl_3 + O_2 \xrightarrow{X} 2COCl_2 + 2HCl$
In the above reaction, X stands for
[CPMT 1985]
(a) An oxidant (b) A reductant
(c) Light and air (d) None of these
6. Phosgene is the common name for
[DPMT 1983; CPMT 1993; MP PMT 1994; Kurukshetra CEE 1998; RPMT 2000, 02]
(a) CO_2 and PH_3 (b) Phosphoryl chloride
(c) Carbonyl chloride (d) Carbon tetrachloride
7. When chloroform is treated with amine and KOH , we get
[CPMT 1979]
(a) Rose odour smell
(b) Sour almond like smell
(c) Offensive odour
(d) Sour oil of winter green like smell
8. A mixture of two organic chlorine compounds was treated with sodium metal in ether solution. Isobutane was obtained as a product. The two chlorine compounds are
[KCET 1988]
(a) Methyl chloride and propyl chloride
(b) Methyl chloride and ethyl chloride
(c) Isopropyl chloride and methyl chloride
(d) Isopropyl chloride and ethyl chloride
9. Alkyl halides can be converted into Grignard reagents by
[KCET 1989]
(a) Boiling them with Mg ribbon in alcoholic solution
(b) Warming them with magnesium powder in dry ether
(c) Refluxing them with $MgCl_2$ solution
(d) Warming them with $MgCl_2$
10. Which is not present in Grignard reagent
[CBSE PMT 1991]
(a) Methyl group (b) Magnesium
(c) Halogen (d) $-COOH$ group
11. The reactivity of ethyl chloride is
[KCET 1986]
(a) More or less equal to that of benzyl chloride
(b) More than that of benzyl chloride
(c) More or less equal to that of chlorobenzene
(d) Less than that of chlorobenzene
12. The reactivity of halogen atom is minimum in
[KCET 1985]
(a) Propyl chloride (b) Propyl iodide
(c) Isopropyl chloride (d) Isopropyl bromide
13. Chlorobenzene is
(a) Less reactive than benzyl chloride
(b) More reactive than ethyl bromide
(c) Nearly as reactive as methyl chloride
(d) More reactive than isopropyl chloride
14. The reactivities of methyl chloride, propyl chloride and chlorobenzene are in the order
[KCET 1988]
(a) Methyl chloride > propyl chloride > chlorobenzene
(b) Propyl chloride > methyl chloride > chlorobenzene
(c) Methyl chloride > chlorobenzene > propyl chloride
(d) Chlorobenzene > propyl chloride > methyl chloride
15. Which of the following compound will make precipitate most readily with $AgNO_3$
[CPMT 1992]
(a) CCl_3CHO (b) $CHCl_3$
(c) $C_6H_5CH_2Cl$ (d) CHI_3
16. Carbylamine is liberated when..... is heated with chloroform and alcoholic potash
[KCET 1992]
(a) An aldehyde (b) A primary amine
(c) A secondary amine (d) A phenol
17. Salicylic acid can be prepared using Reimer-Tiemann's reaction by treating phenol with
[KCET 1989]
(a) Methyl chloride in the presence of anhydrous aluminium chloride
(b) Carbon dioxide under pressure in sodium hydroxide solution
(c) Carbon tetrachloride and concentrated sodium hydroxide
(d) Sodium nitrite and a few drops of concentrated sulphuric acid
18. Grignard reagent is prepared by the reaction between
[CBSE PMT 1994; DPMT 1996; Pb. PMT 1999; MH CET 1999]
(a) Zinc and alkyl halide
(b) Magnesium and alkyl halide
(c) Magnesium and alkane
(d) Magnesium and aromatic hydrocarbon
19. Reaction of *t*-butyl bromide with sodium methoxide produces
[CBSE PMT 1994]
(a) Isobutane (b) Isobutylene
(c) Sodium *t*-butoxide (d) *t*-butyl methyl ether
20. War gas is formed from
[BHU 1995]
(a) PH_3 (b) C_2H_2
(c) Zinc phosphate (d) Chloropicrin
21. What happens when CCl_4 is treated with $AgNO_3$
[EAMCET 1987; CBSE PMT 1988; MP PET 2000]

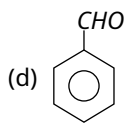
- (a) NO_2 will be evolved
 (b) A white ppt. of AgCl will be formed
 (c) CCl_4 will dissolve in AgNO_3
 (d) Nothing will happen
22. If we use pyrene (CCl_4) in the Riemer-Tiemann reaction in place of chloroform, the product formed is
 [CBSE PMT 1989; MP PMT 1990; MH CET 1999]
 (a) Salicylaldehyde (b) Phenolphthalein
 (c) Salicylic acid (d) Cyclohexanol
23. $\text{C}_6\text{H}_5\text{CH}_2\text{Cl} + \text{KCN}(\text{aq.}) \rightarrow \text{X} + \text{Y}$
 Compounds X and Y are [BHU 1979]
 (a) $\text{C}_6\text{H}_6 + \text{KCl}$ (b) $\text{C}_6\text{H}_5\text{CH}_2\text{CN} + \text{KCl}$
 (c) $\text{C}_6\text{H}_5\text{CH}_3 + \text{KCl}$ (d) None of these
24. The bad smelling substance formed by the action of alcoholic caustic potash on chloroform and aniline is
 [MP PMT 1971, 92, 2001; CPMT 1971, 86; AFMC 2002; RPMT 1999]
 (a) Phenyl isocyanide (b) Nitrobenzene
 (c) Phenyl cyanide (d) Phenyl isocyanate
25. Ethylidene chloride on treatment with aqueous KOH gives [MP PMT 1986]
 (a) Ethylene glycol (b) Acetaldehyde
 (c) Formaldehyde (d) None
26. Reaction $\text{C}_2\text{H}_5\text{I} + \text{C}_5\text{H}_{11}\text{I} + 2\text{Na} \rightarrow \text{C}_2\text{H}_5 - \text{C}_5\text{H}_{11} + 2\text{NaI}$ is called [MP PMT 1992]
 (a) Hoffmann's reaction
 (b) Dow's reaction
 (c) Wurtz's reaction
 (d) Riemer-Tiemann's reaction
27. In presence of AlCl_3 , benzene and *n*-propyl bromide react in Friedel-Craft's reaction to form [MP PMT 1991]
 (a) *n*-propyl benzene
 (b) 1, 2-dinormal propyl benzene
 (c) 1, 4-dinormal propyl benzene
 (d) Isopropyl benzene
28. The dehydrobromination of 2-bromobutane gives $\text{CH}_3\text{CH}=\text{CHCH}_3$. The product is
 (a) Hofmann product
 (b) Saytzeff product
 (c) Hoffmann-Saytzeff product
 (d) Markownikoff product
29. Ethylene difluoride on hydrolysis gives
 (a) Glycol (b) Fluoroethanol
 (c) Difluoroethanol (d) Freon
30. Benzyl chloride when oxidised by $\text{pb}(\text{NO}_3)_2$ gives [MP PMT 1989]
 (a) Benzoic acid (b) Benzaldehyde
 (c) Benzene (d) None
31. Which of the following statements about chloroform is false [Manipal MEE 1995]
 (a) It is a colourless, sweet-smelling liquid
 (b) It is almost insoluble in water
 (c) It is highly inflammable
 (d) It can be used as an inhalational anaesthetic agent
32. CCl_4 cannot give precipitate with AgNO_3 due to [CPMT 1979]
 (a) Formation of complex with AgNO_3
 (b) Evolution of Cl_2 gas
 (c) Chloride ion is not formed
 (d) AgNO_3 does not give silver ion
33. On heating CHCl_3 with aq. NaOH , the product is [CPMT 1971, 78; BHU 1997; EAMCET 1998; JIPMER (Med.) 2002]
 (a) CH_3COONa (b) HCOONa
 (c) Sodium oxalate (d) CH_3OH
34. Ethyl bromide reacts with lead-sodium alloy to form [MP PMT/PET 1988; MP PET 1997]
 (a) Tetraethyl lead (b) Tetraethyl bromide
 (c) Both (a) and (b) (d) None of the above
35. Iodoform heated with Ag powder to form [DPMT 1985]
 (a) Acetylene (b) Ethylene
 (c) Methane (d) Ethane
36. Ethyl bromide reacts with silver nitrite to form [DPMT 1985; IIT-JEE 1991]
 (a) Nitroethane
 (b) Nitroethane and ethyl nitrite
 (c) Ethyl nitrite
 (d) Ethane
37. Which of the following reactions leads to the formation of chloritone [RPMT 2003]
 (a) $\text{CHCl}_3 + \text{CH}_3\text{COCH}_3$ (b) $\text{CCl}_4 + \text{Acetone}$
 (c) $\text{CHCl}_3 + \text{KOH}$ (d) $\text{CHCl}_3 + \text{HNO}_3$
38. $\text{CH}_3 - \text{CH}_2 - \text{CH}_2\text{Br} + \text{KOH}(\text{alc.}) \rightarrow \text{Product}$
 Product in above reaction is [RPMT 2003]
 (a) $\text{CH}_3 - \text{CH} = \text{CH}_2$ (b) $\text{CH}_3 - \text{CH}_2 - \text{CH}_3$
 (c) (a) and (b) both (d) None of these
39. $\text{A} + \text{CCl}_4 + \text{KOH} \rightarrow \text{Salicylic acid}$
 'A' in above reaction is [RPMT 2003]



(a)



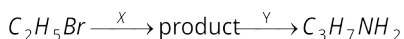
(b)



(c)

(d)

40. Identify X and Y in the following sequence



[Orissa JEE 2005]

(a) $X = KCN, Y = LiAlH_4$ (b) $X = KCN, Y = H_3O^+$ (c) $X = CH_3Cl, Y = AlCl_3 / HCl$ (d) $X = CH_3NH_2, Y = HNO_2$

41. 1-chlorobutane reacts with alcoholic KOH to form

[IIT-JEE 1991; AFMC 1998]

(a) 1-butene

(b) 2-butene

(c) 1-butanol

(d) 2-butanol

42. Which of the following reactions gives $H_2C = C = C = CH_2$

[Roorkee Qualifying 1998]

(a) $CH_2Br - CBr = CH_2 \xrightarrow{Zn / CH_3OH}$ (b) $HC \equiv C - CH_2 - COOH \xrightarrow[40^\circ C]{Aq. K_2CO_3}$ (c) $CH_2Br - C \equiv C - CH_2Br \xrightarrow[Heat]{Zn}$ (d) $2CH_2 = CH - CH_2I \longrightarrow$

43. When ethyl amine is heated with chloroform and alcoholic KOH , a compound with offensive smell is obtained. This compound is [CPMT 1983, 84; RPMT 2002]

(a) A secondary amine

(b) An isocyanide

(c) A cyanide

(d) An acid

44. Chlorobenzene on fusing with solid $NaOH$ gives

[DPMT 1981; CPMT 1990]

(a) Benzene

(b) Benzoic acid

(c) Phenol

(d) Benzene chloride

45. DDT can be prepared by reacting chlorobenzene (in the presence of conc. H_2SO_4) with

(a) Cl_2 in ultraviolet light

(b) Chloroform

(c) Trichloroacetone

(d) Chloral hydrate

46. When phenol reacts with $CHCl_3$ and KOH , the product obtained would be [RPMT 1997]

(a) Salicylaldehyde

(b) p -hydroxy

benzaldehyde

(c) Both (a) and (b)

(d) Chloretone

47. Ethyl chloride on heating with silver cyanide forms a compound X . The functional isomer of X is

[EAMCET 1997; KCET 2005]

(a) C_2H_5NC (b) C_2H_5CN (c) $H_3C - NH - CH_3$ (d) $C_2H_5NH_2$

48. Which of the following statements is incorrect [CPMT 1977]

(a) C_2H_5Br reacts with alco. KOH to form C_2H_5OH (b) C_2H_5Br when treated with metallic sodium gives ethane(c) C_2H_5Br when treated with sodium ethoxide forms diethyl ether(d) C_2H_5Br with $AgCN$ forms ethyl isocyanide

49. When chloroform is exposed to air and sunlight, it gives

[NCERT 1984; CPMT 1978, 87; CBSE PMT 1990; EAMCET 1993; MNR 1994; MP PET 1997, 2000; BHU 2001; AFMC 2002]

(a) Carbon tetrachloride

(b) Carbonyl chloride

(c) Mustard gas

(d) Lewisite

50. An organic halide is shaken with aqueous $NaOH$ followed by the addition of dil. HNO_3 and silver nitrate solution gave white ppt. The substance can be

[JIPMER 1997]

(a) $C_6H_4(CH_3)Br$ (b) $C_6H_5CH_2Cl$ (c) C_6H_5Cl

(d) None of these

51. A compound A has a molecular formula C_2Cl_3OH . It reduces Fehling solution and on oxidation gives a monocarboxylic acid (B). A is obtained by action of chlorine on ethyl alcohol. A is

[CBSE PMT 1994; MP PET 1997; KCET 2005]

(a) Chloral

(b) $CHCl_3$ (c) CH_3Cl

(d) Chloroacetic acid

52. Following equation illustrates



[Bihar CEE 1995]

(a) Dow's process

(b) Kolbe's process

(c) Carbylamine test

(d) Haloform reaction

53. One of the following that cannot undergo dehydrohalogenation is [J & K 2005]

(a) Iso-propyl bromide

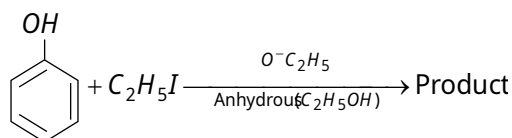
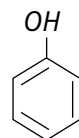
(b) Ethanol

(c) Ethyl bromide

(d) None of these

54. A compound X on reaction with chloroform and $NaOH$ gives a compound with a very unpleasant odour. X is

[MP PMT 1999]

(a) $C_6H_5CONH_2$ (b) $C_6H_5NH_2$ (c) $C_6H_5CH_2NHCH_3$ (d) $C_6H_5NHCH_3$ 

55.

In the above reaction product is

- (a) $C_6H_5OC_2H_5$ (b) $C_2H_5OC_2H_5$
(c) $C_6H_5OC_6H_5$ (d) C_6H_5I

56. $C_2H_5Cl + KCN \longrightarrow X \xrightarrow{\text{Hydrolysis}} Y$. 'X' and 'Y' are

[MP PET 1995]

- (a) C_2H_6 and C_2H_5CN
(b) C_2H_5CN and C_2H_6
(c) C_2H_5CN and $C_2H_5CH_2NH_2$
(d) C_2H_5CN and C_2H_5COOH

57. Iodoform is formed on warming I_2 and $NaOH$ with

[MP PET 1995; DCE 1999; RPET 1999; RPMT 2002]

- (a) C_2H_5OH (b) CH_3OH
(c) $HCOOH$ (d) C_6H_6

58. Which of the following reacts with phenol to give salicylaldehyde after hydrolysis [MP PMT 1995]

- (a) Dichloromethane (b) Trichloromethane
(c) Methyl chloride (d) None of these

59. Dehydrohalogenation in monohaloalkanes produces

- (a) A single bond (b) A double bond
(c) A triple bond (d) Fragmentation

60. When chloroform is treated with conc. HNO_3 it gives

[CPMT 1986; MP PMT 1989; AFMC 1998, 99;

EAMCET 1991; BHU 1999]

- (a) $CHCl_2NO_2$ (b) CCl_3NO_2
(c) $CHCl_2HNO_3$ (d) None of these

61. A sample of chloroform being used as anaesthetic is tested by [AIIMS 1980; CPMT 1983]

- (a) Fehling solution
(b) Ammoniacal Cu_2Cl_2
(c) $AgNO_3$ solution
(d) $AgNO_3$ solution after boiling with alcoholic KOH solution

62. Dehydrohalogenation of an alkyl halide is [MP PMT 1996]

- (a) An addition reaction (b) A substitution reaction
(c) An elimination reaction (d) An oxidation reaction

reaction

63. Reaction of aqueous sodium hydroxide on (i) ethyl bromide and (ii) chlorobenzene gives

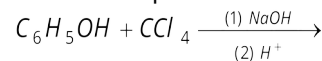
- (a) (i) Ethene and (ii) o-chlorophenol
(b) (i) Ethyl alcohol and (ii) o-chlorophenol

- (c) (i) Ethyl alcohol and (ii) phenol
(d) (i) Ethyl alcohol and (ii) no reaction

64. 2-bromopentane is heated with potassium ethoxide in ethanol. The major product obtained is [CBSE PMT 1998]

- (a) Pentene-1 (b) cis pentene-2
(c) trans pentene-2 (d) 2-ethoxypentane

65. What is the product formed in the following reaction



[KCET 1998]

- (a) p-hydroxybenzoic acid (b) o-hydroxybenzoic acid
(c) Benzaldehyde (d) Salicylaldehyde

66. When chloroform is treated with excess oxygen it forms

[MH CET 1999]

- (a) $COCl_2 + HCl$
(b) $COCl_2 + Cl_2 + H_2$
(c) $COCl_2 + Cl_2 + H_2O$
(d) No product will be formed

67. Which isomer of cyclohexane hexachloride is a very strong insecticide [MP PET 2003]

- (a) α (b) β
(c) γ (d) δ

68. Haloalkane in the presence of alcoholic KOH undergoes

[KCET (Engg/Med.) 2002]

- (a) Elimination (b) Polymerisation
(c) Dimerisation (d) Substitution

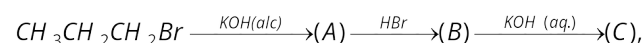
69. The set of compounds in which the reactivity of halogen atom in the ascending order is [KCET (Engg.) 2002]

- (a) Vinyl chloride, chloroethane, chlorobenzene
(b) Vinyl chloride, chlorobenzene, chloroethane
(c) Chloroethane, chlorobenzene, vinyl chloride
(d) Chlorobenzene, vinyl chloride, chloroethane

70. Alkyl halides react with Mg in dry ether to form [DPMT 2000; MP PET 2001]

- (a) Magnesium halide (b) Grignard's reagent
(c) Alkene (d) Alkyne

71. In the following sequence of reactions



The product (C) is

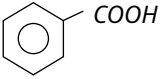
[JIPMER 2001]

- (a) Propan-2-ol (b) Propan-1-ol
(c) Propyne (d) Propene

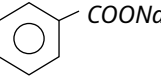
72. Alkyl halide on heating with alc. NH_3 in a sealed tube results... [Orissa JEE 2002]

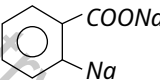
- (a) 1° amine (b) 2° amine
(c) 3° amine (d) All of these

73. When $CH_3CH_2CHCl_2$ is treated with $NaNH_2$, the product formed is [CBSE PMT 2002]
 (a) $CH_3 - CH = CH_2$ (b) $CH_3 - C \equiv CH$
 (c) $CH_3CH_2CH(NH_2)(Cl)$ (d) $CH_3CH_2C(NH_2)_2$
74. By heating a mixture of $CHCl_3$ with silver powder, the compound formed is [Kurukshetra CET 2002]
 (a) Acetylene (b) Silver acetate
 (c) Methanol (d) None of these
75. Chloropicrin is [Kurukshetra CET 2002]
 (a) Trichloro acetaldehyde (b) Nitrochloroform
 (c) 2,4,6-trinitro phenol (d) None of these
76. Which of the following are correct statements about C_2H_5Br [Roorkee 1999]
 (a) It reacts with metallic Na to give ethane
 (b) It gives nitroethane on heating with aqueous ethanolic solution of $AgNO_2$
 (c) It gives C_2H_5OH on boiling with alcoholic potash
 (d) It forms ethylacetate on heating with silver acetate
77. Aryl halide is less reactive than alkyl halide towards nucleophilic substitution because [RPMT 2002]
 (a) Less stable carbonium ion
 (b) Due to large $C - Cl$ bond energy
 (c) Inductive effect
 (d) Resonance stabilization and sp^2 - hybridisation of C attached to halide
78. Methyl chloride reacts with silver acetate to yield [BVP 2003]
 (a) Acetaldehyde (b) Acetyl chloride
 (c) Methyl acetate (d) Acetic acid
79. Chloroform for anesthetic purposes is tested for its purity with the reagent [DPMT 2001]
 (a) Silver nitrate (b) Lead nitrate
 (c) Ammoniacal Cu_2Cl_2 (d) Lead nitrate
80. 2, 6 - Dimethylheptane on monochlorination produces..... derivatives [DPMT 2001]
 (a) 5 (b) 6
 (c) 3 (d) 4
81. The less reactivity of chlorine atom in $CH_2 = CH - Cl$ is due to [DCE 2001]
 (a) Inductive effect (b) Resonance stabilization
 (c) Electromeric effect (d) Electronegativity
82. $CH_3 - CH_2 - Br \xrightarrow{alc.KCN} CH_3CH_2CN \xrightarrow{HOH} X$
 In this reaction, product X is [MH CET 2002]
 (a) Acetic acid (b) Propionic acid
 (c) Butyric acid (d) Formic acid
83. In alkaline hydrolysis of a tertiary alkyl halide by aqueous alkali if concentration of alkali is doubled, then the reaction [MH CET 2002]
 (a) Will be doubled (b) Will be halved
 (c) Will remain constant (d) Can't say
84. $AgNO_3$ does not give precipitate with $CHCl_3$ because [MP PET 1999; CPMT 2002]
 (a) $CHCl_3$ does not ionise in water
 (b) $AgNO_3$ does not reacts with $CHCl_3$
 (c) $CHCl_3$ is chemically inert
 (d) None of these
85. The reaction between chlorobenzene and chloral in the presence of concentrated sulphuric acid produces [Pb. PMT 2001]
 (a) Gammexane
 (b) p,p -dichloro diphenyl trichloro ethane
 (c) Chloropicrin
 (d) Benzene hexachloride
86. False statement is [RPET 1999]
 (a) Chloroform is heavier than water
 (b) CCl_4 is non-inflammable
 (c) Vinyl chloride is more reactive than allyl chloride
 (d) Br^- is a good nucleophile as compared to I^-
87. Chloroform is slowly oxidised by air in presence of light to form [MH CET 1999; UPSEAT 2001, 02; RPMT 2003]
 (a) Formyl chloride (b) Phosgene
 (c) Trichloroacetic acid (d) Formic acid
88. Alcoholic potash is used to bring about [KCET (Engg.) 2001]
 (a) Dehydrogenation (b) Dehydration
 (c) Dehydrohalogenation (d) Dehalogenation
89. Vinyl chloride reacts with HCl to form [JIPMER 2000]
 (a) 1, 1- dichloro ethane
 (b) 1, 2- dichloro ethane
 (c) Tetrachloro ethylene
 (d) Mixture of 1, 2 and 1, 1 - dichloro ethane
90. $R - X + NaOH \longrightarrow ROH + NaX$
 The above reaction is classified as [BHU 1982; CBSE PMT 1991; RPET 2000]
 (a) Nucleophilic substitution
 (b) Electrophilic substitution
 (c) Reduction
 (d) Oxidation
91. Reduction of acetyl chloride with H_2 in presence of Pd gives [MP PMT 2001]
 (a) CH_3COCH_3 (b) C_2H_5OH

- (c) CH_3COOH (d) CH_3CHO
92. When methyl bromide is heated with Zn it gives [MP PMT 2001]
 (a) CH_4 (b) C_2H_6
 (c) C_2H_4 (d) CH_3OH
93. Phenol reacts with $CHCl_3$ and $NaOH$ (at $340K$) to give [MP PMT 1997; CBSE PMT 2002]
 (a) o-chlorophenol (b) Salicylaldehyde
 (c) Benzaldehyde (d) Chlorobenzene
94. Iodoform on heating with KOH gives [MP PMT 2000]
 (a) CH_3CHO (b) CH_3COOK
 (c) $HCOOK$ (d) $HCHO$
95. Which reaction is correct in the conversion of chloroform to acetylene [Pb. PMT 2000]
 (a) $CHCl_3 + AgNO_3$ (b) $CHCl_3 + O_2$
 (c) $CHCl_3 + HNO_3$ (d) $CHCl_3 + Ag$
96. Which of the following gases are poisonous [Pb. PMT 2000]
 (a) $CHCl_3$ (b) CO_2
 (c) None of these (d) CO
97. Which of the following alkyl halide is used as a methylating agent [KCET (Med.) 2000; MP PET 1999]
 (a) CH_3I (b) C_2H_5Br
 (c) C_2H_5Cl (d) C_6H_5Cl
98. $C_6H_6Cl_6$, on treatment with alcoholic KOH , yields [AFMC 2000]
 (a) C_6H_6 (b) $C_6H_3Cl_3$
 (c) $(C_6H_6)OH$ (d) $C_6H_6Cl_4$
99. When ethyl iodide is heated with silver nitrate, the product obtained is [CPMT 2000]
 (a) C_2H_5Ag (b) $Ag-O-NO_2$
 (c) $C_2H_5O-NO_2$ (d) $C_2H_5I-NO_2$
100. $CHCl_3$ and HF lead to the formation of a compound of fluorine of molecular weight 70. The compound is [RPET 2000]
 (a) Fluoroform (b) Fluorine monoxide
 (c) Fluorine dioxide (d) Fluoromethanol
101. Chloroform with zinc dust in water gives [UPSEAT 2000]
 (a) CH_4 (b) Chloropicrin
 (c) CCl_4 (d) CH_2Cl_2
102. Which of the following is used as a catalyst for preparing Grignard reagent [KCET 1998]
 (a) Iron powder (b) Iodine powder
 (c) Activated charcoal (d) Manganese dioxide
103. For a given alkyl group the densities of the halides follow the order [MP PMT 1997]
 (a) $RI < RBr < RCl$ (b) $RI < RCl < RBr$
 (c) $RBr < RI < RCl$ (d) $RCl < RBr < RI$
104. Which halide will be least reactive in respect to hydrolysis [MP PET 2003]
 (a) Vinyl chloride (b) Allyl chloride
 (c) Ethyl chloride (d) t-Butyl chloride
105. In nucleophilic aliphatic substitution, the nucleophiles are generally
 (a) Acids (b) Bases
 (c) Salts (d) Neutral molecules
106. Which one of the following compounds does not react with bromine [DPMT 1983]
 (a) Ethylamine (b) Propene
 (c) Phenol (d) Chloroform
107. Allyl chloride on dehydro chlorination gives [Kerala (Med.) 2003]
 (a) Propadiene (b) Propylene
 (c) Acetylchloride (d) Acetone
108. Toluene reacts with excess of Cl_2 in presence of sunlight to give a product which on hydrolysis followed by reaction with $NaOH$ gives [Orissa JEE 2004]
- 

(a)



(b)
- 

(c)

(d) None of these
109. An alkyl bromide produces a single alkene when it reacts with sodium ethoxide and ethanol. This alkene undergoes hydrogenation and produces 2-methyl butane. What is the identity of the alkyl bromide [Kerala PMT 2004]
 (a) 1-bromo-2, 2-dimethylpropane
 (b) 1-bromobutane
 (c) 1-bromo-2-methylbutane
 (d) 2-bromo-2-methylbutane
 (e) 2-bromopentane
110. On treating a mixture of two alkyl halides with sodium metal in dry ether, 2-methyl propane was obtained. The alkyl halides are [KCET 2004]
 (a) 2-chloropropane and chloromethane
 (b) 2-chloropropane and chloroethane
 (c) Chloromethane and chloroethane
 (d) Chloromethane and 1-chloropropane
111. In which case formation of butane nitrile is possible [Orissa JEE 2004]

- (a) $C_3H_7Br + KCN$ (b) $C_4H_9Br + KCN$
 (c) $C_3H_7OH + KCN$ (d) $C_4H_9OH + KCN$
- 112.** The reaction of an aromatic halogen compound with an alkyl halides in presence of sodium and ether is called [MP PMT 2004]
 (a) Wurtz reaction
 (b) Sandmeyer's reaction
 (c) Wurtz-fittig reaction
 (d) Kolbe reaction
- 113.** The compound added to prevent chloroform to form phosgene gas is [MP PET 2004]
 (a) C_2H_5OH (b) CH_3COOH
 (c) CH_3COCH_3 (d) CH_3OH
- 114.** Among the following, the one which reacts most readily with ethanol is [AIIMS 2004]
 (a) *p*-nitrobenzyl bromide
 (b) *p*-chlorobenzyl bromide
 (c) *p*-methoxybenzyl bromide
 (d) *p*-methylbenzyl bromide
- 115.** Chloropicrin is obtained by the reaction of [CBSE PMT 2004]
 (a) Chlorine on picric acid
 (b) Nitric acid on chloroform
 (c) Steam on carbon tetrachloride
 (d) Nitric acid on chlorobenzene
- 116.** In Wurtz reaction alkyl halide react with [MH CET 2004]
 (a) Sodium in ether (b) Sodium in dry ether
 (c) Sodium only (d) Alkyl halide in ether
- 117.** Chloroform, when kept open, is oxidised to [CPMT 2004]
 (a) CO_2 (b) $COCl_2$
 (c) CO_2, Cl_2 (d) None of these
- 118.** Chloroform reacts with concentrated HNO_3 to give [Pb. CET 2000]
 (a) Water gas (b) Tear gas
 (c) Laughing gas (d) Producer gas
- 119.** When ethyl chloride and alcoholic KOH are heated, the compound obtained is [MH CET 2003]
 (a) C_2H_4 (b) C_2H_2
 (c) C_6H_6 (d) C_2H_6
- 120.** Chloroform, on warming with Ag powder, gives [MH CET 2003]
 (a) C_2H_6 (b) C_3H_8
 (c) C_2H_4 (d) C_2H_2
- 121.** When alkyl halide is heated with dry Ag_2O , it produces [CPMT 1997; BHU 2004]
 (a) Ester (b) Ether
 (c) Ketone (d) Alcohol
- 122.** Reaction of alkyl halides with aromatic compounds in presence of anhydrous $AlCl_3$ is known as [UPSEAT 2004]
 (a) Friedal-Craft reaction
 (b) Hofmann degradation
 (c) Kolbe's synthesis
 (d) Beckmann rearrangement
- 123.** Two percent of ethanol is added during the oxidation of chloroform to stop the formation of carbonyl chloride. In this reaction ethanol acts as [Pb. CET 2001]
 (a) Auto catalyst (b) Negative catalyst
 (c) Positive catalyst (d) None of these
- 124.** When benzene is heated with chlorine in the presence of sunlight, it forms [Pb. CET 2000]
 (a) B.H.C. (b) Cyclopropane
 (c) *p*-dichlorobenzene (d) None of these
- 125.** Ethylene di bromide on heating with metallic sodium in ether solution yields [Pb. CET 2004]
 (a) Ethene (b) Ethyne
 (c) 2-butene (d) 1-butene
- 126.** The reaction, $CH_3Br + Na \rightarrow$ Product, is called [Pb. CET 2003]
 (a) Perkin reaction (b) Levit reaction
 (c) Wurtz reaction (d) Aldol condensation
- 127.** At normal temperature iodoform is [MP PET 2004]
 (a) Thick viscous liquid (b) Gas
 (c) Volatile liquid (d) Solid
- 128.** Which of the following statements about benzyl chloride is incorrect [KCET 2004]
 (a) It is less reactive than alkyl halides
 (b) It can be oxidised to benzaldehyde by boiling with copper nitrate solution
 (c) It is a lachrymatory liquid and answers Beilstein's test
 (d) It gives a white precipitate with alcoholic silver nitrate
- 129.** Ethylene dichloride and ethylidene chloride are isomeric compounds. The false statement about these isomers is that they [DCE 2003]
 (a) React with alcoholic potash and give the same product
 (b) Are position isomers
 (c) Contain the same percentage of chlorine
 (d) Are both hydrolysed to the same product
- 130.** An alkyl bromide (X) reacts with Na to form 4, 5-diethyloctane. Compound X is [Roorkee 1999]
 (a) $CH_3(CH_2)_3Br$
 (b) $CH_3(CH_2)_5Br$
 (c) $CH_3(CH_2)_3CH.Br.CH_3$
 (d) $CH_3(CH_2)_2CH.Br.CH_2CH_3$

131. In the following reaction X is



[MP PET 1994]

- (a) CH_2Cl_2 (b) $CHCl_3$
(c) CH_3Cl (d) CCl_4

132. Which metal is used in Wurtz synthesis

[CPMT 1986; DPMT 1979; MP PET 2002]

- (a) Ba (b) Al
(c) Na (d) Fe

133. Which of the following is boiled with ethyl chloride to form ethyl alcohol

[MNR 1982]

- (a) Alcoholic KOH (b) Aqueous KOH
(c) H_2O (d) H_2O_2

134. Why is chloroform put into dark coloured bottles

[MP PET 2002]

- (a) To prevent evaporation
(b) To prevent from moisture
(c) To prevent it from oxidation to form phosgene
(d) To prevent its reaction with glass

135. DDT is

- (a) A solid (b) A liquid
(c) A gas (d) A solution

136. Bottles containing C_6H_5I and $C_6H_5CH_2I$ lost their original labels. They were labelled A and B for testing. A and B were separately taken in test tubes and boiled with $NaOH$ solution. The end solution in each tube was made acidic with dilute HNO_3 and then some $AgNO_3$ solution was added. Substance B give a yellow precipitate. Which one of the following statements is true for this experiment

[AIEEE 2003]

- (a) A was C_6H_5I
(b) A was $C_6H_5CH_2I$
(c) B was C_6H_5I
(d) Addition of HNO_3 was unnecessary

137. Which of the following statements is incorrect regarding benzyl chloride

[KCET 2003]

- (a) It gives white precipitate with alcoholic $AgNO_3$
(b) It is an aromatic compound with substitution in the side chain
(c) It undergoes nucleophilic substitution reaction
(d) It is less reactive than vinyl chloride

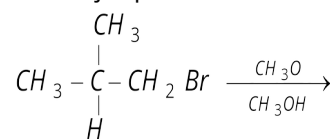
138. Alkyl halide can be converted into alkene by

[BCECE 2005]

- (a) Nucleophilic substitution reaction
(b) Elimination reaction
(c) Both nucleophilic substitution and elimination reaction

(d) Rearrangement

139. The major product formed in the following reaction is



[AIIMS 2005]

- (a) $CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{H}{|}}{C}} - CH_2OCH_3$ (b)
(c) $CH_3 - \overset{\overset{CH_3}{|}}{C} = CH_2$
(d) $CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{OCH_3}{|}}{C}} - CH_3$

140. The major product obtained on treatment of $CH_3CH_2CH(F)CH_3$ with CH_3O^- / CH_3OH is

[AIIMS 2005]

- (a) $CH_3CH_2CH(OCH_3)CH_3$
(b) $CH_3CH = CHCH_3$
(c) $CH_3CH_2CH = CH_2$
(d) $CH_3CH_2CH_2CH_2OCH_3$

141. When phenyl magnesium bromide reacts with t -butanol, the product would be

[IIT 2005]

- (a) Benzene (b) Phenol
(c) t -butyl benzene (d) t -butyl phenyl ether

142. Alkyl halides react with dialkyl copper reagents to give

[AIEEE 2005]

- (a) Alkenes (b) Alkyl copper halides
(c) Alkanes (d) Alkenyl halides

143. Which of the following is liquid at room temperature

[AFMC 2005]

- (a) CH_3I (b) CH_3Br
(c) C_2H_5Cl (d) CH_3F

144. Which of the following haloalkanes is most reactive

[KCET 2005]

- (a) 1-chloropropane (b) 1-bromopropane
(c) 2-chloropropane (d) 2-bromopropane

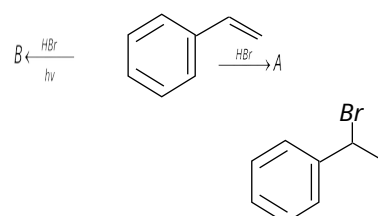
145. Grignard reagent adds to

[KCET 2005]

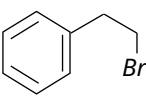
- (a) $>C=O$ (b) $-C \equiv N$
(c) $>C=S$ (d) All of the above

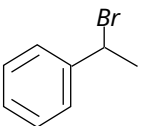
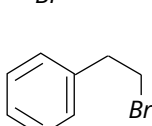
146. Analyse the following reaction and identify the nature of A and B

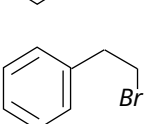
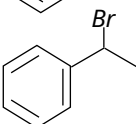
[Kerala CET 2005]

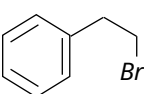
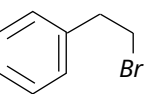


(a) Both A and B are

(b) Both A and B are 

(c) A is  & B is 

(d) A is  & B is 

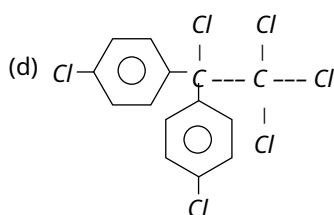
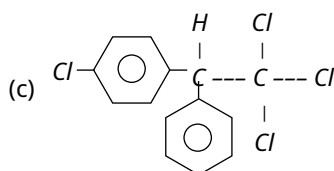
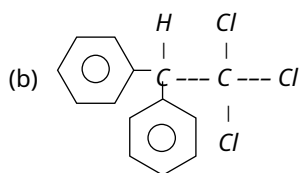
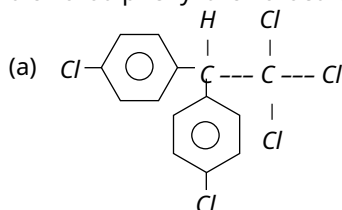
(e) A is  & B is 

Uses of Halogen Containing Compounds

1. Which of these can be used as moth repellent [CPMT 1987]

- (a) Benzene hexachloride (b) Benzal chloride
(c) Hexachloroethane (d) Tetrachloroethane

2. Which one of the following is the correct formula of dichlorodiphenyl trichloroethane [AIIMS 1982]



3. The compound $(CH_3)_2C(OH)CCl_3$ is

- (a) Chloretone (b) Chloroquin
(c) Chloropicrin (d) Chloropropyl chloride

4. Depletion of ozone layer is caused by [RPMT 2002]

- (a) Freon (b) Alkane
(c) Grignard reagent (d) All of these

5. Which of the following is Teflon [RPMT 2002]

- (a) $[-CF_2 - CF_2 -]_n$ (b) $CF_2 = CF_2$
(c) $CF \equiv CF$ (d) None of these

6. Statement "Ozone in atmosphere is decreased by chloro-fluoro-carbon (Cl_2F_2C)" [RPET 1999]

- (a) Is true
(b) Is false
(c) Only in presence of CO_2
(d) Only in absence of CO_2

7. CF_xCl_y [where $x + y = 4$]. These compounds are not used because [RPET 2000]

- (a) These are fluoro carbons
(b) These are difficult to synthesise
(c) They deplete ozone layer
(d) None of the these

8. The molecular formula of DDT has [MP PMT 1997]

- (a) 5 chlorine atoms (b) 4 chlorine atoms
(c) 3 chlorine atoms (d) 2 chlorine atoms

9. What is the reagent used for testing fluoride ion in water [EAMCET 2003]

- (a) Alizarin - S (b) Quinalizarin
(c) Phenolphthalein (d) Benzene

10. Chloropicrin is used as [UPSEAT 2000]

- (a) Solvent (b) Anaesthetic
(c) Perfume (d) Tear gas

11. Which is used in the manufacture of plastic

- (a) $CH_2 = CHCl$ (b) $CH \equiv CH$
(c) $CH_2 = CH - CH_2I$ (d) CCl_4

12. Freon (dichlorodifluoro methane) is used [CPMT 1986; DPMT 1983; CBSE PMT 2001]

- (a) As local anaesthetic
(b) For dissolving impurities in metallurgical process
(c) In refrigerator
(d) In printing industry

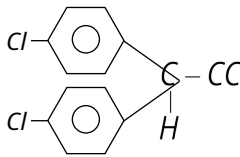
13. Which of the following is known as freon which is used as a refrigerant [DPMT 1982; CPMT 1979, 81, 89; AFMC 1995;

Manipal MEE 1995; MP PET 1995, 2004]

- (a) CCl_2F_2 (b) $CHCl_3$
(c) CH_2F_2 (d) CF_4

14. Benzene hexachloride (BHC) is used as [MP PMT 1994; KCET 1999]

- (a) Dye (b) Antimalarial drug




- (c) Antibiotic (d) Insecticide
15. Which plastic is obtained from CHCl_3 as follows
- $$\text{CHCl}_3 \xrightarrow[\text{SbF}_3]{\text{HF}} \text{X} \xrightarrow{800^\circ\text{C}} \text{Y} \xrightarrow{\text{Polymerisation}} \text{Plastic}$$
- (a) Bakelite (b) Teflon
(c) Polythene (d) Perspex
16. . The above structural formula refers to
- [MP PET 1997]
- (a) BHC (b) DNA
(c) DDT (d) RNA
17. The commercial uses of DDT and benzene hexachloride are
- (a) DDT is a herbicide, benzene hexachloride is a fungicide
(b) Both are insecticides
(c) Both are herbicides
(d) DDT is a fungicide and benzene hexachloride is a herbicide
18. Which of the following is used in fire extinguishers
- [AFMC 1993]
- (a) CH_4 (b) CHCl_3
(c) CH_2Cl_2 (d) CCl_4
19. Iodoform can be used as
- [NCERT 1981]
- (a) Anaesthetic (b) Antiseptic
(c) Analgesic (d) Antifebrin
20. Which of the following is an anaesthetic
- [AFMC 1989]
- (a) C_2H_4 (b) CHCl_3
(c) CH_3Cl (d) $\text{C}_2\text{H}_5\text{OH}$
21. An important insecticide is obtained by the action of chloral on chlorobenzene. It is
- [KCET 1989]
- (a) BHC (b) Gammexene
(c) DDT (d) Lindane
22. In fire extinguisher, pyrene is
- [DPMT 1985]
- (a) CO_2 (b) CCl_4
(c) CS_2 (d) CHCl_3
23. B.H.C. is used as
- [Pb. CET 2002]
- (a) Insecticide (b) Pesticide
(c) Herbicide (d) Weedicide
24. The use of the product obtained as a result of reaction between acetone and chloroform is
- [RPMT 1999]
- (a) Hypnotic (b) Antiseptic
(c) Germicidal (d) Anaesthetic
25. Use of chlorofluoro carbons is not encouraged because

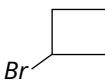
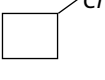


- [KCET 2005]
- (a) They are harmful to the eyes of people that use it
(b) They damage the refrigerators and air conditioners
(c) They eat away the ozone in the atmosphere
(d) They destroy the oxygen layer

Critical Thinking

Objective Questions

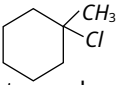
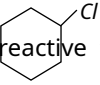
- Among the following, the molecule with the highest dipole moment is [IIT-JEE (Screening) 2003]
(a) CH_3Cl (b) CH_2Cl_2
(c) CHCl_3 (d) CCl_4
- When CHCl_3 is boiled with NaOH , It gives [Orissa JEE 2003]
(a) Formic acid (b) Trihydroxy methane
(c) Acetylene (d) Sodium formate
- The hybridization state of carbon atoms in the product formed by the reaction of ethyl chloride with aqueous potassium hydroxide is [EAMCET 1997]
(a) sp (b) sp^2
(c) sp^3 (d) sp^3d
- Which of the following compounds does not undergo nucleophilic substitution reactions [KCET 1998]
(a) Vinyl chloride (b) Ethyl bromide
(c) Benzyl chloride (d) Isopropyl chloride
- Replacement of Cl of chlorobenzene to give phenol requires drastic conditions but chlorine of 2, 4-dinitrochlorobenzene is readily replaced because [CBSE PMT 1997]
(a) NO_2 make ring electron rich at ortho and para
(b) NO_2 withdraws e^- from meta position
(c) denotes e^- at meta position
(d) NO_2 withdraws e^- from ortho/para positions
- Among the following one with the highest percentage of chlorine is [MNR 1989; BHU 1998; MH CET 1999]
(a) Chloral (b) Pyrene
(c) PVC (d) Gammexene
- In which alkyl halide, $\text{S}_\text{N}2$ mechanism is favoured maximum [RPMT 1997]
(a) CH_3Cl (b) $\text{CH}_3\text{CH}_2\text{Cl}$
(c) $(\text{CH}_3)_2\text{CHCl}$ (d) $(\text{CH}_3)_3\text{C}-\text{Cl}$
- Which conformation of $\text{C}_6\text{H}_6\text{Cl}_6$ is most powerful insecticide
(a) aaeeee (b) aaeeee

- (c) $aaaaee$ (d) $aaaaaa$
9. The odd decomposition of carbon chlorine bond form [UPSEAT 1999]
 (a) Two free ions (b) Two-carbanium ion
 (c) Two carbanion (d) A cation and an anion
10. A new carbon-carbon bond formation is possible in [IIT-JEE 1998]
 (a) Cannizzaro reaction (b) Friedel-Craft's alkylation
 (c) Clemmensen reduction (d) Reimer-Tiemann reaction
11. An isomer of $C_3H_6Cl_2$ on boiling with aqueous KOH gives acetone. Hence, the isomer is [UPSEAT 2000]
 (a) 2,2-dichloropropane (b) 1,2-dichloropropane
 (c) 1,1-dichloropropane (d) 1,3-dichloropropane
12. Which of the following is the example of S_N^2 reaction [CPMT 1999]
 (a) $CH_3Br + OH^- \longrightarrow CH_3OH + Br^-$
 (b) $CH_3CHCH_3 + OH^- \longrightarrow CH_3CH(OH)CH_3 + Br^-$
 (c) $CH_3CH_2OH \xrightarrow{-H_2O} CH_2=CH_2$
 (d) $CH_3-C(CH_3)(Br)-CH_3 + OH^- \longrightarrow CH_3-C(CH_3)(OH)-CH_3 + Br^-$
13. Wurtz reaction of methyl iodide yields an organic compound X. Which one of the following reactions also yields X [EAMCET 2003]
 (a) $C_2H_5Cl + Mg \xrightarrow{\text{dry ether}}$
 (b) $C_2H_5Cl + LiAlH_4 \longrightarrow$
 (c) $C_2H_5Cl + C_2H_5ONa \longrightarrow$
 (d) $CHCl_3 \xrightarrow[\Delta]{Ag \text{ powder}}$
14. Ethyl orthoformate is formed by heating with sodium ethoxide [EAMCET 2003]
 (a) $CHCl_3$ (b) C_2H_5OH
 (c) $HCOOH$ (d) CH_3CHO
15. 1,2 di-bromo cyclohexane on dehydro halogenation gives [UPSEAT 2003]
 (a)  (b) 
 (c)  (d) None of these

16. In which one of the following conversions phosphorus pentachloride is used as a reagent [EAMCET 1997]
 (a) $H_2C=CH_2 \rightarrow CH_3CH_2Cl$
 (b) $H_3C-O-CH_3 \rightarrow CH_3Cl$
 (c) $CH_3CH_2OH \rightarrow CH_3CH_2Cl$
 (d) $HC \equiv CH \rightarrow CH_2=CHCl$
17. When but-3-en-2-ol reacts with aq. HBr , the product formed is [DCE 2001]
 (a) 3-bromobut-1-ene
 (b) 1-bromobut-2-ene
 (c) A mixture of both a and b
 (d) 2-bromobut-2-ene
18. Which of these do not form Grignard reagent
 (a) CH_3F (b) CH_3Cl
 (c) CH_3Br (d) CH_3I
19. An organic compound $A(C_4H_6Cl)$ on reaction with Na /diethyl ether gives a hydrocarbon, which on monochlorination gives only one chloro derivative. A is [Kerala PMT 2004]
 (a) *t*-butyl chloride (b) *s*-butyl chloride
 (c) Isobutyl chloride (d) *n*-butyl chloride
 (e) None of these
20. Among the following the most reactive towards alcoholic KOH is [AIIMS 2004]
 (a) $CH_2=CHBr$ (b) $CH_3COCH_2CH_2Br$
 (c) CH_3CH_2Br (d) $CH_3CH_2CH_2Br$
21. Which one of the following possess highest m.pt. [Pb. CET 2004]
 (a) Chlorobenzene (b) *o*-dichlorobenzene
 (c) *m*-dichlorobenzene (d) *p*-dichlorobenzene
22. Which chlorine atom is more electronegative in the following [UPSEAT 2004]
 (a) CH_3-Cl (b) CH_3-CH_2-Cl
 (c) $H-C(CH_3)_2-Cl$ (d) $CH_3-CH_2-C(CH_3)_2-Cl$
23. What would be the product formed when 1-Bromo-3-chloro cyclobutane reacts with two equivalents of metallic sodium in ether [IIT-JEE (Screening) 2005]
 (a)  (b) 
 (c)  (d) 

Read the assertion and reason carefully to mark the correct option out of the options given below:

- (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.
 (b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
 (c) If assertion is true but reason is false.
 (d) If the assertion and reason both are false.
 (e) If assertion is false but reason is true.

- Assertion : CHCl_3 is stored in transparent bottles.
Reason : CHCl_3 is oxidised in dark. [AIIMS 1996]
- Assertion : Addition of bromine to trans-2-butene yields meso-2, 3-dibromobutane
Reason : Bromine addition to an alkene is an electrophilic addition.
[IIT-JEE (Screening) 2001]
- Assertion : Alkyl halides are soluble in organic solvents.
Reason : *p*-dichlorobenzene possesses low melting point.
- Assertion : CCl_4 is not a fire extinguisher.
Reason : CCl_4 is insoluble in water.
- Assertion : Aqueous hydrohalogen acids are used to prepare alkyl halides from alkenes.
Reason : Hydrogen iodide readily reacts with alkenes to form alkyl halides.
- Assertion : Alkyl halides form alkenes when heated above 300°C .
Reason : $\text{CH}_3\text{CH}_2\text{I}$ react slowly with strong base when compared to $\text{CD}_3\text{CH}_2\text{I}$.
- Assertion : Halogen acids react with alcohols to form haloalkanes.
Reason : Order of reactivity of halogen acids $\text{HCl} > \text{HBr} > \text{HI}$
- Assertion :  is less reactive than  towards reactions.
Reason : Tertiary alkyl halides react predominantly by $\text{S}_{\text{N}}1$ mechanism.

- Assertion : Electron withdrawing groups in aryl halides decrease the reactivity towards nucleophilic substitution.
Reason : 2, 4-Dinitrochlorobenzene is less reactive than chlorobenzene.
- Assertion : Aryl halides undergo electrophilic substitutions more readily than benzene.
Reason : Aryl halide gives a mixture of *o*- and *p*-products.
- Assertion : Addition of Br_2 to cis-but-2-ene is stereoselective.
Reason : $\text{S}_{\text{N}}2$ reactions are stereospecific as well as stereoselective.
- Assertion : Optically active 2-iodobutane on treatment with NaI in acetone undergoes racemization.
Reason : Repeated Walden inversions on the reactant and its product eventually gives a racemic mixture.
- Assertion : Nucleophilic substitution reaction on an optically active alkyl halide gives a mixture of enantiomers.
Reason : The reaction occurs by $\text{S}_{\text{N}}1$ mechanism.

Answers

Introduction of Halogen containing compounds

1	a	2	b	3	b	4	c	5	b
6	a	7	b	8	a	9	b	10	a
11	d	12	a	13	b				

Preparation of Halogen containing compounds

1	b	2	d	3	b	4	a	5	a
6	b	7	d	8	d	9	b	10	a
11	a	12	b	13	a	14	a	15	a
16	b	17	a	18	b	19	c	20	c
21	a	22	c	23	c	24	b	25	d
26	d	27	c	28	a	29	c	30	b
31	c	32	b	33	d	34	a	35	c
36	d	37	c	38	b	39	b	40	d
41	c	42	c	43	a	44	b	45	b
46	a	47	c	48	a	49	b	50	a
51	b	52	a	53	d	54	a		

Properties of Halogen containing compounds

1	a	2	c	3	c	4	c	5	c
6	c	7	c	8	c	9	b	10	d
11	b	12	c	13	a	14	a	15	d
16	b	17	c	18	b	19	b	20	d
21	d	22	c	23	b	24	a	25	b
26	c	27	d	28	b	29	a	30	b
31	c	32	c	33	b	34	a	35	a
36	a	37	a	38	a	39	a	40	a
41	a	42	c	43	b	44	c	45	d
46	c	47	b	48	ab	49	b	50	b
51	a	52	a	53	b	54	b	55	a
56	d	57	a	58	b	59	b	60	b
61	c,d	62	c	63	c	64	c	65	b
66	c	67	c	68	a	69	d	70	b
71	a	72	d	73	d	74	a	75	b
76	b,d	77	d	78	c	79	a	80	d
81	b	82	b	83	c	84	a	85	b
86	cd	87	b	88	c	89	a	90	a
91	d	92	b	93	b	94	c	95	d
96	d	97	a	98	b	99	c	100	a
101	a	102	b	103	d	104	a	105	b
106	d	107	a	108	b	109	c	110	a
111	a	112	c	113	a	114	c	115	b
116	a	117	b	118	b	119	a	120	d
121	b	122	a	123	b	124	a	125	c
126	c	127	d	128	a	129	d	130	d
131	b	132	c	133	b	134	c	135	a
136	a	137	d	138	b	139	d	140	b
141	a	142	c	143	a	144	d	145	d
146	c								

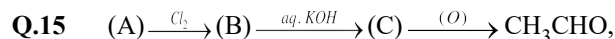
Uses of Halogen containing compounds

1	c	2	a	3	a	4	a	5	a
6	a	7	c	8	a	9	a	10	d
11	a	12	c	13	a	14	d	15	b
16	c	17	b	18	d	19	b	20	b
21	c	22	b	23	a	24	a	25	c

EXERCISE # 1

(MCQ OF HALOALKANE)

- Q.1** Select the alkane which forms four isomeric dihalo derivatives -
 (1) Isobutane (2) Propane
 (3) Neopentane (4) Ethane
- Q.2** Which of the following hydrocarbon with formula C_8H_{18} gives one monochloro derivatives -
 (1) n-Octane
 (2) 3-Methyl heptane
 (3) 2, 2, 4 - Trimethyl butane
 (4) 2, 2, 3, 3 - Tetramethyl butane
- Q.3** Which of the following statement is correct -
 (1) Decreasing order of density of alkyl halides is $RI > RBr > RCl > RF$
 (2) The stability order of alkyl halides is $RF > RCl > RBr > RI$
 (3) Among isomeric alkyl halides the decrease in boiling point $1^\circ > 2^\circ > 3^\circ$
 (4) All are correct
- Q.4** Which statement is not correct -
 (1) Polyhalides are lighter than water
 (2) Halo alkanes have higher boiling points as compared to those of corresponding alkanes
 (3) Halides are soluble in organic solvents
 (4) None
- Q.5** An alkyl halide is insoluble in water because-
 (1) Alkyl halide is non polar & H_2O is polar
 (2) Both are polar
 (3) Alkyl halide does not form hydrogen bond with water
 (4) Alkyl halide has halogen atom in it
- Q.6** The correct order of polarity of alkyl halides is : -
 (1) $RI > RBr < RCl > RF$
 (2) $RF > RCl > RBr > RI$
 (3) $RCl > RF > RBr > RI$
 (4) None of these
- Q.7** Which chloride is the most reactive towards aqueous NaOH in -
 (1) Methyl chloride (2) Isopropyl chloride
 (3) Vinyl chloride (4) Benzyl chloride
- Q.8** The S_N^2 reactivity order for halides :-
 (1) $R - F > R - Cl > R - Br > R - I$
 (2) $R - I > R - Br > R - Cl > R - F$
 (3) $R - Br > R - I > R - Cl > R - F$
 (4) $R - Cl > R - Br > R - F > R - I$
- Q.9** In S_N^1 reaction, the first step involves the formation of : -
 (1) Free radical (2) Carbanion
 (3) Carbocation (4) Final product
- Q.10** The rate law for the reaction, $RCl + NaOH(aq.) \rightarrow ROH + NaCl$ is given by, $rate = K_1 [RCl]$. The rate of the reaction will be : -
 (1) Doubled on doubling the concentration of sodium hydroxide
 (2) Halved on reducing the concentration of alkyl halide to half
 (3) Decreased on increasing the temperature of the reaction
 (4) Unaffected by increasing the temperature of the reaction
- Q.11** Which of the following statements is invalid-
 (1) The more stable the carbocation the faster it is formed
 (2) Propyl cation changes to more stable isopropyl carbocation by 1,2 shift of a hydrogen
 (3) Isopropyl chloride reacts with sodium ethoxide to form 1-ethoxypropane
 (4) All the above
- Q.12** Which of the following reaction is the most common among alkyl halides -
 (1) Nucleophilic addition
 (2) Nucleophilic substitution
 (3) Electrophilic addition
 (4) Electrophilic substitution
- Q.13** When an alkyl halide reacts with an alkoxide, the product is -
 (1) Ether (2) Ester
 (3) Hydrocarbon (4) Alcohol
- Q.14** 2-Bromobutane on heating with alcoholic alkali forms -
 (1) α - Butylene only
 (2) β - Butylene only
 (3) 20% of β -Butylene+ 80% of α -Butylene
 (4) 80% β -Butylene + 20% α -Butylene



Identify A, B & C -

- (1) Ethylalcohol, Ethyl chloride & Ethane
- (2) Ethane, Ethylchloride & $\text{CH}_3\text{-CH}_2\text{-OH}$
- (3) Propane, Propylchloride & $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$
- (4) All the above

Q.16 An alkyl halide reacted with a metal cyanide to give an alkanenitrile. The metal cyanide is -

- (1) AgCN
- (2) KCN
- (3) $\text{Cu}_2(\text{CN})_2$
- (4) $\text{Ba}(\text{CN})_2$

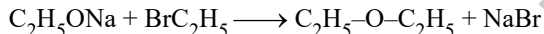
Q.17 Ethylthioalcohol can be obtained when $\text{C}_2\text{H}_5\text{Br}$ reacts with -

- (1) KSH
- (2) NaOH
- (3) K_2S
- (4) Na_2S

Q.18 Which one of the following reaction is known as strecker's reaction -

- (1) $\text{R-X} + \text{NaI} \rightarrow \text{R-I} + \text{NaX}$
- (2) $\text{R-X} + \text{Na}_2\text{SO}_3 \rightarrow \text{R-SO}_3\text{Na} + \text{NaX}$
- (3) $\text{RCOOAg} + \text{Br}_2 \rightarrow \text{R-Br} + \text{AgBr} + \text{CO}_2$
- (4) None of the above

Q.19 The given reaction is called as -



- (1) Frankland reaction
- (2) Wurtz reaction
- (3) Williamson's synthesis
- (4) Cannizzaro reaction

Q.20 Reaction of ethyl chloride with sodium leads to -

- (1) Ethane
- (2) Propane
- (3) n-Butane
- (4) n-pentane

Q.21 An alkyl halide reacts with metallic sodium in dry ether, the reaction is known as -

- (1) Frankland's reaction
- (2) Sandmeyer's reaction
- (3) Wurtz's reaction
- (4) Kolbe's reaction

Q.22 When ethyl bromide is treated with moist Ag_2O the product is -

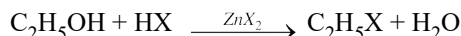
- (1) Ethyl ether
- (2) Ethanol
- (3) Ethoxy ethane
- (4) All of the above

Q.23 When propylene reacts with HBr in presence of peroxide, the product formed is -

- (1) n-Propyl alcohol
- (2) Propylene peroxide
- (3) n-Propyl bromide

(4) 1,3-Dibromo propene

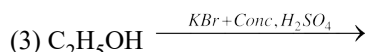
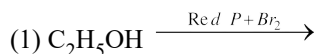
Q.24 In reaction



the order of reactivity of HX is -

- (1) $\text{HBr} > \text{HI} > \text{HCl}$
- (2) $\text{HI} > \text{HCl} > \text{HBr}$
- (3) $\text{HCl} > \text{HBr} > \text{HI}$
- (4) $\text{HI} > \text{HBr} > \text{HCl}$

Q.25 Which of the following leads to the formation of an alkyl halide -



(4) All the above

Q.26 Which halide/halides not prepared by Darzen reaction -

- (1) R-Cl
- (2) R-Br
- (3) R-I
- (4) (2) & (3) both

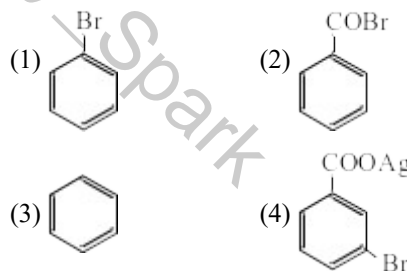
Q.27 Which reaction is termed as Darzen's Reaction -

- (1) $\text{ROH} + \text{HCl}$
- (2) $\text{ROH} + \text{PCl}_5$
- (3) $\text{ROH} + \text{SOCl}_2$
- (4) $\text{ROH} + \text{PCl}_3$

Q.28 In the Hunsdiecker reaction -

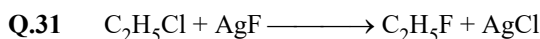
- (1) Number of carbon atoms decrease
- (2) Number of carbon atoms increase
- (3) Number of carbon atoms remain same
- (4) None of the above

Q.29 Silver benzoate reacts with bromine in acetone to form -



Q.30 In Finkelstein Reaction, which reactants are used -

- (1) $\text{NaI} + \text{C}_2\text{H}_5\text{OH}$
- (2) $\text{NaCl} + \text{acetone}$
- (3) $\text{NaBr} + \text{CH}_3\text{COCH}_3$
- (4) $\text{NaI} + \text{CH}_3\text{COCH}_3$



The above reaction is called -

- (1) Hunsdiecker
- (2) Swart

- (3) Strecker (4) Wurtz
- Q.32** The general molecular formula of dihaloalkanes is -
 (1) $C_nH_{2n+1}X$ (2) $C_nH_{2n+2}X_2$
 (3) $C_nH_{2n}X_2$ (4) $C_nH_{2n-2}X_2$
- Q.33** A vicinal dihalide is not formed in the reaction-
 (1) $HOCH_2-CH_2OH \xrightarrow{PBr_3}$
 (2) $CH_3-CH=CH_2 \xrightarrow{Br_2}$
 (3) $CH\equiv CH \xrightarrow{HBr} \xrightarrow{HBr}$
 (4) $CH_3-CH=CHBr \xrightarrow[Peroxide]{HBr}$
- Q.34** A gem dichloride is formed in the reaction except -
 (1) CH_3CHO and PCl_5
 (2) CH_3COCH_3 and PCl_5
 (3) $CH_2=CH_2$ and Cl_2
 (4) $CH_2=CHCl$ and HCl
- Q.35** 2,2-dichloropropane on hydrolysis yields -
 (1) Acetone (2) 2,2-Propane diol
 (3) Isopropyl alcohol (4) Acetaldehyde
- Q.36** Propylidene chloride when heated with zinc gives -
 (1) Ethene (2) Propene
 (3) 1-Butene (4) 3-Hexene
- Q.37** Ethylene amine is the substitution product of -
 (1) Ethylene chloride (2) Gem dihalide
 (3) Both of these (4) None of these
- Q.38** $CHCl_3$ is kept in brown bottles well stoppered and also with 1% alcohol so that it may not form -
 (1) CH_2Cl_2 (2) $COCl_2$
 (3) CCl_4 (4) None of these
- Q.39** Chloroform can be obtained from -
 (1) Methanol (2) Methanal
 (3) 1-Propanol (4) 2-Propanol
- Q.40** Which of the following statement is wrong -
 (1) All carbonyl compounds of the general structure

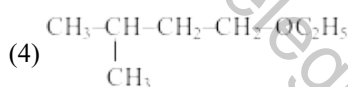
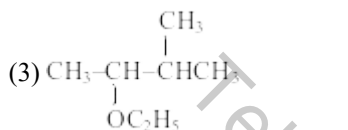
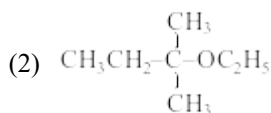
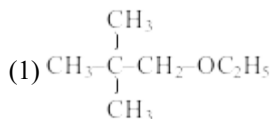
$$\begin{array}{c} CH_3-C-R \\ || \\ O \end{array}$$
 give a positive iodoform test
 (2) All secondary alcohols give iodoform reaction
 (3) Alkanols of the structure $CH_3CH(OH)-R$ (where $R=H$, alkyl or aryl) give iodoform reaction
- (4) The only aldehyde giving iodoform reaction is acetaldehyde.
- Q.41** The oxidation of $CHCl_3$ by air & light is prevented by adding -
 (1) CH_3COOH (2) C_2H_5OH
 (3) CH_3CHO (4) CH_3COOCH_3
- Q.42** Tear gas is -
 (1) $C(NO_2)Cl_3$ (2) $COCl_2$
 (3) CH_3Cl (4) CH_3COCl
- Q.43** Hoffmann's isocyanide reaction involves the intermediate formation of -
 (1) $:CCl_2$ (2) CH_3^{\oplus}
 (3) CH_3^{\ominus} (4) $\bullet CCl_3$
- Q.44** Chloroform when treated with aniline and alcoholic KOH forms -
 (1) Phenyl cyanide (2) Phenyl isocyanide
 (3) Phenyl cyanate (4) Phenyl isocyanate
- Q.45** Iodoform test is not given by : -
 (1) $CH_3COCH_2COOC_2H_5$
 (2) CH_3COCH_3
 (3) $CH_3CH_2COCH_3$
 (4) $CH_3CH_2CHOHCH_3$
- Q.46** 2-methyl butanoic acid is formed by the reaction $CHCl_3$, $NaOH$ and -
 (1) Propene (2) Ethene
 (3) Methane (4) 2-Butene
- Q.47** Main product of which of the following reactions shows zero dipole moment -
 (1) CH_3OH , PCl_5
 (2) C_2H_5OH , OH^- , Cl_2
 (3) $CHCl_3$, Cl_2 , $h\nu$
 (4) CHI_3 , Zn , HCl
- Q.48** What happens when CCl_4 is treated with $AgNO_3$ -
 (1) A white ppt. of $AgCl$ will be formed
 (2) Nothing will happen
 (3) NO_2 will be evolved
 (4) CCl_4 will dissolved in $AgNO_3$
- Q.49** $CCl_4 + 4KOH \longrightarrow$ end product of the reaction is-
 (1) K_2CO_3 (2) CO_2
 (3) $C(OH)_4$ (4) $HCOOK$
- Q.50** Catalyst used in the formation of dichlorodifluoromethane is generated from -

- (1) $\text{AlCl}_3 + \text{HF}$ (2) $\text{SbCl}_5 + \text{HF}$
 (3) $\text{SbCl}_4 + \text{HF}$ (4) $\text{BF}_3 + \text{HF}$
- Q.51** $\text{CH}_3\text{CHI}_2 \xrightarrow{\text{KCN}} \xrightarrow{\text{H}_2\text{O}, \Delta} ?$
 Here the end product would be -
 (1) 2-Cyano propionic acid
 (2) Ethane-1,1-dicarboxylic acid
 (3) 2-Methyl ethanoic acid
 (4) Propionic acid
- Q.52** Industrial preparation of chloroform employs acetone and -
 (1) Phosgene
 (2) Calcium hypochlorite
 (3) Chlorine gas
 (4) Sodium chloride
- Q.53** The elimination of HX from an alkyl halide forms an alkene. The order of the elimination reaction is -
 (1) 3° halide $>$ 2° halides $>$ 1° halides
 (2) 1° halide $>$ 2° halides $>$ 3° halides
 (3) 1° halide $=$ 2° halides $>$ 3° halides
 (4) 2° halide $>$ 1° halides $>$ 3° halides
- Q.54** $\text{A} \xrightarrow{\text{O}^- \text{Br}} \text{CHBr}_3$
 Here A is nothing but -
 (1) Isopropyl alcohol (2) Methanol
 (3) Ethanoic acid (4) n- Butyl alcohol
- Q.55** Of the following, which is an $\text{S}_{\text{N}}1$ reaction -
 (1) $(\text{CH}_3)_3\text{CBr} + \text{H}_2\text{O} \longrightarrow$
 (2) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl} + \text{I}^- \longrightarrow$
 (3) $(\text{CH}_3)_3\text{CBr} + \text{CN}^- \longrightarrow$
 (4) $\text{CH}_3\text{CHBrCH}_3 + \text{KOH}(\text{alc.}) \longrightarrow$
- Q.56** In the reaction,
 $\text{C}_2\text{H}_5\text{OH} + \text{HX} \xrightarrow{\text{ZnX}_2} \text{C}_2\text{H}_5\text{X}$
 the order of reactivity of HX is -
 (1) $\text{HBr} > \text{HI} > \text{HCl}$ (2) $\text{HI} > \text{HBr} > \text{HCl}$
 (3) $\text{HI} > \text{HCl} > \text{HBr}$ (4) $\text{HCl} > \text{HBr} > \text{HI}$
- Q.57** $\text{CH}_3\text{Br} \xrightarrow{\text{KCN}} (\text{A}) \xrightarrow[\text{Reduction}]{\text{Na/EtOH}} \text{CH}_3\text{CH}_2\text{NH}_2$
 IUPAC name of (A) is -
 (1) Methyl cyanide (2) Methyl isonitrile
 (3) Acetonitrile (4) Ethane nitrile
- Q.58** Impure chloroform can be tested by -
 (1) Concentrated sulphuric acid
 (2) Blue litmus
 (3) Silver nitrate solution
 (4) All the above
- Q.59** The reaction of ethyl bromide with a lead-sodium alloy gives -
 (1) Tetraethyl bromide (2) Tetraethyl lead
 (3) Sodium ethoxide (4) None of these
- Q.60** A strong solution of alcoholic alkali will preferentially promote alkyl halide into an alkene by -
 (1) Addition (2) Elimination
 (3) Polymerisation (4) Substitution
- Q.61** Treatment of ammonia with excess ethyl chloride will give -
 (1) Diethylamine
 (2) Ethane
 (3) Methylamine
 (4) Tetraethyl ammonium chloride
- Q.62** The mixture of two organic chlorine compounds on treatment with sodium metal in ether solution gives isobutane as one of the products. The reactants are -
 (1) Methyl chloride and propyl chloride
 (2) Methyl chloride and ethyl chloride
 (3) Isopropyl chloride and ethyl chloride
 (4) Isopropyl chloride and methyl chloride
- Q.63** In the reaction
 $\text{CH}_3\text{CH}_2\text{CHBrCH}_3 + (\text{CH}_3)_3\text{COK} \longrightarrow$ the main product is -
 (1) $\begin{array}{c} \text{CH}_3\text{CH}_2\text{CHCH}_3 \\ | \\ \text{OC}(\text{CH}_3)_3 \end{array}$ (2) $\begin{array}{c} \text{CH}_3\text{CH}_2\text{CHCH}_3 \\ | \\ \text{OH} \end{array}$
 (3) $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$ (4) $\text{CH}_3\text{CH}=\text{CHCH}_3$
- Q.64** The iodoform test is used to show one particular structural unit in -
 (1) Aliphatic alcohols (2) Aromatic acids
 (3) Aliphatic acid (4) Hydrocarbons
- Q.65** Treatment of ethylidene chloride with aq. KOH gives -
 (1) Ethylene (2) Acetaldehyde
 (3) Formaldehyde (4) None of these
- Q.66** $\text{A} + \text{PCl}_5 \longrightarrow \text{POCl}_3 + \text{Alkyl halide}$. Compound A would be -
 (1) Alkanone (2) Alkane
 (3) Alkanol (4) Alkanal
- Q.67** Chloroform is used as a laboratory reagent for testing the presence of -
 (1) Nitro compound
 (2) Primary amines

- (3) Secondary amines
(4) Tertiary amines
- Q.68** The reaction of chloroform with acetone gives-
(1) Mesitylene (2) Ethylidene chloride
(3) Chloroform (4) Chloral
- Q.69** CCl_4 is used as a fire extinguisher because-
(1) Of its covalent bond
(2) Of its low b.p.
(3) Of its high m.p.
(4) It gives incombustible vapours
- Q.70** $(\text{CH}_3)_3\text{CBr} + \text{OH}^- \longrightarrow (\text{CH}_3)_3\text{COH} + \text{Br}^-$
Which of the following statements is true for the above reaction -
(1) If we double $[\text{RBr}]$ the rate become four times
(2) If we reduce $[\text{OH}^-]$ to half, there is no change in the rate.
(3) If we double $[\text{RBr}]$ the rate does not change.
(4) If we double $[\text{OH}^-]$ the rate double
- Q.71** Unimolecular nucleophilic substitution $[\text{S}_\text{N}1]$ involves steps, while bimolecular nucleophilic substitution involves..... steps -
(1) Two, one (2) One, two
(3) Two, two (4) One, three
- Q.72** The reactivities of CH_3Cl , $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$ and chlorobenzene are in the order -
(1) $\text{CH}_3\text{Cl} > \text{CH}_3\text{CH}_2\text{CH}_2\text{Cl} > \text{C}_6\text{H}_5\text{Cl}$
(2) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl} > \text{CH}_3\text{Cl} > \text{C}_6\text{H}_5\text{Cl}$
(3) $\text{C}_6\text{H}_5\text{Cl} > \text{CH}_3\text{CH}_2\text{CH}_2\text{Cl} > \text{CH}_3\text{Cl}$
(4) $\text{CH}_3\text{Cl} > \text{C}_6\text{H}_5\text{Cl} > \text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$
- Q.73** For $\text{CH}_3\text{Br} + \text{OH}^- \longrightarrow \text{CH}_3\text{OH} + \text{Br}^-$ the rate of reaction is given by the expression-
(1) $\text{rate} = k [\text{CH}_3\text{Br}]$
(2) $\text{rate} = k [\text{OH}^-]$
(3) $\text{rate} = k [\text{CH}_3\text{Br}] [\text{OH}^-]$
(4) $\text{rate} = k [\text{CH}_3\text{Br}]^0 [\text{OH}^-]^0$
- Q.74** In the reaction $\text{CH}_3\text{CHCl}_2 \xrightarrow{\text{aq. KOH}} \text{X}$. X is -
(1) $\text{CH}_3\text{CH}_2\text{OH}$ (2) $(\text{CH}_3)_2\text{CO}$
(3) $\begin{array}{c} \text{CH}_2-\text{CH}_2 \\ | \quad | \\ \text{OH} \quad \text{OH} \end{array}$ (4) CH_3CHO
- Q.75** Which of the following on alkaline hydrolysis gives ethanal -
(1) Chloroform
(2) Ethylidene chloride
(3) 1, 2-Di chloro ethane
(4) Methylene chloride
- Q.76** Arrange the following in decreasing order of C-halogen bond length -
(1) $\text{CH}_3\text{I} > \text{CH}_3\text{Br} > \text{CH}_3\text{Cl} > \text{CH}_3\text{F}$
(2) $\text{CH}_3\text{F} > \text{CH}_3\text{Br} > \text{CH}_3\text{I} > \text{CH}_3\text{Cl}$
(3) $\text{CH}_3\text{Cl} > \text{CH}_3\text{Br} > \text{CH}_3\text{I} > \text{CH}_3\text{F}$
(4) $\text{CH}_3\text{I} > \text{CH}_3\text{Cl} > \text{CH}_3\text{Br} > \text{CH}_3\text{F}$
- Q.77** Freon - 112 is -
(1) $\text{C}_2\text{Cl}_4\text{F}_2$ (2) CCl_2F_2
(3) CCl_3F (4) $\text{C}_2\text{Br}_4\text{F}_2$
- Q.78** $\text{CH}_3\text{CCl}_3 \xrightarrow[\text{hydrolysis}]{\text{alkaline}} \text{A} \xrightarrow[\text{CCl}_4]{\text{AgOH}} \text{B} \xrightarrow{\text{Br}_2} \text{C}$
A and C in the above sequence are respectively -
(1) Acetic acid, ethyl bromide
(2) Acetic acid, ethyl chloride
(3) Acetic acid, methyl bromide
(4) Acetic acid, methyl chloride
- Q.79** The ease of dehydrohalogenation with alcoholic KOH will be -
chloroethane (I),
2-chloropropane(II),
2-chloro-2-methylpropane(III)
(1) $\text{III} > \text{II} > \text{I}$ (2) $\text{I} > \text{II} > \text{III}$
(3) $\text{II} > \text{I} > \text{III}$ (4) $\text{I} > \text{III} > \text{II}$
- Q.80** $\text{R}-\text{X} \xrightarrow{\text{R}-\text{N}=\text{O}} \text{O}$
The reagent Z in the above reaction is -
(1) NaNO_2
(2) KNO_2
(3) $\text{NaNO}_2 + \text{dil. HCl}$
(4) AgNO_2
- Q.81** In the reaction $\text{RCOOAg} + \text{Br}_2 \xrightarrow{\text{CCl}_4} \text{RBr} + \text{CO}_2 + \text{AgBr}$ the intermediate formed is -
(1) $\text{R}-\text{COOBr}$ (2) RCOO^\bullet
(3) R^\bullet (4) all of these
- Q.82** Consider the following reaction sequence.
 $\text{CH}_3\text{C}\equiv\text{CH} \xrightarrow[\text{HgSO}_4]{\text{aq. H}_2\text{SO}_4} \text{A} \xrightarrow[\text{heat}]{\text{PCl}_5} \text{B}$
The product (A) and (B) are, respectively -
(1) CH_3COCH_3 and $\text{CH}_3\text{CCl}_2\text{CH}_3$
(2) $\text{CH}_3\text{CH}_2\text{CHO}$ and $\text{CH}_3\text{CH}_2\text{CHCl}_2$
(3) $\text{CH}_3\text{CHOHCH}_3$ and $\text{CH}_3\text{CHClCH}_3$

(4) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ and $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$

- Q.83** Neopentyl bromide is allowed to react with sodium ethoxide in ethanol. The major substitution product formed in the reaction is -



- Q.84** Which of the following reactions will not give an isocyanide -

- (1) $\text{CH}_3\text{CH}_2\text{Br} + \text{AgCN} \longrightarrow$
 (2) $\text{CH}_3\text{CH}_2\text{NH}_2 + \text{CHCl}_3 + \text{KOH} \xrightarrow{\text{heat}}$
 (3) $\text{CH}_3\text{CH}_2\text{CONH}_2 + \text{P}_2\text{O}_5 \xrightarrow{\text{heat}}$
 (4) All of the above

- Q.85** Which of the following processes does not occur during the formation of CHCl_3 from $\text{C}_2\text{H}_5\text{OH}$ and bleaching powder -

- (1) Oxidation (2) Chlorination
 (3) Hydrolysis (4) Reduction

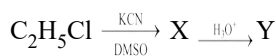
- Q.86** Which of the following reactions is not expected to give a satisfactory yield of alkyl iodide -

- (1) $\text{CH}_3\text{CH}_2\text{OH} + \text{KI} + \text{H}_3\text{PO}_4 \longrightarrow$
 (2) $\text{CH}_3\text{CH}_2\text{OH} + \text{PI}_3 \xrightarrow{\text{heat}}$
 (3) $\text{CH}_3\text{CH}_2\text{Br} + \text{NaI} \xrightarrow{\text{acetone}}$
 (4) $\text{CH}_3\text{CH}_2\text{COOAg} + \text{I}_2 \xrightarrow[\text{Heat}]{\text{CCl}_4}$

- Q.87** 2-Bromopentane is heated with potassium ethoxide in ethanol. The major product is -

- (1) trans-2-pentene
 (2) 2-ethoxypentane
 (3) 1-pentene
 (4) cis-2-pentene

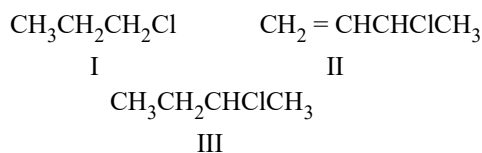
- Q.88** Consider the following sequence of reactions.



The products (X) and (Y) are, respectively -

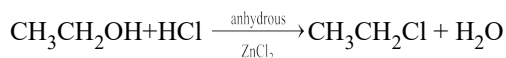
- (1) $\text{C}_2\text{H}_5\text{CN}$ and $\text{C}_2\text{H}_5\text{CH}_2\text{NH}_2$
 (2) $\text{C}_2\text{H}_5\text{CN}$ and $\text{C}_2\text{H}_5\text{CONH}_2$
 (3) $\text{C}_2\text{H}_5\text{NC}$ and $\text{C}_2\text{H}_5\text{NHCH}_3$
 (4) $\text{C}_2\text{H}_5\text{CN}$ and $\text{C}_2\text{H}_5\text{COOH}$

- Q.89** The order of decreasing $\text{S}_{\text{N}}1$ reactivities of the halides is -



- (1) $\text{I} > \text{II} > \text{III}$ (2) $\text{II} > \text{I} > \text{III}$
 (3) $\text{II} > \text{III} > \text{I}$ (4) $\text{III} > \text{II} > \text{I}$

- Q.90** In the preparation of ethyl chloride by the reaction



the major reason for using anhydrous ZnCl_2 as a catalyst is that

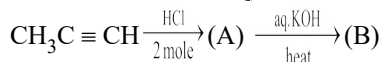
- (1) It absorbs water formed in the reaction and drives the equilibrium to the right
 (2) It coordinates with the product $\text{CH}_3\text{CH}_2\text{Cl}$ and drives the reaction to the right
 (3) It assists in forming the nucleophile Cl^- from HCl
 (4) It coordinates with oxygen of ethyl alcohol and increases the leaving group ability of the $-\text{OH}$ group

- Q.91** Which of the following reactions is likely to give the greatest yield of n-propyl bromide ?

- (1) $\text{CH}_3\text{CH}=\text{CH}_2 + \text{HBr} \longrightarrow$
 (2) $\text{CH}_3\text{CH}_2\text{CH}_3 + \text{Br}_2 \xrightarrow{\text{h}\nu}$
 (3) $\begin{array}{c} \text{H}_2\text{C}-\text{CH}_2 \\ | \quad | \\ \text{CH}_2 \end{array} + \text{HBr} \longrightarrow$

- (4) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl} + \text{NaBr} \xrightarrow{\text{acetone}}$

- Q.92** Consider the following reaction sequence.

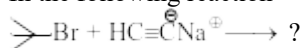


The products (A) and (B) are, respectively,

- (1) $\text{CH}_3\text{CH}_2\text{CHCl}_2$ and $\text{CH}_3\text{CH}_2\text{CHO}$
 (2) $\text{CH}_3\text{CCl}_2\text{CH}_3$ and CH_3COCH_3
 (3) $\text{CH}_3\text{CCl}_2\text{CH}_3$ and $\text{CH}_3\text{C}\equiv\text{CH}$

(4) $\text{CH}_3\text{CHClCH}_2\text{Cl}$ and $\text{CH}_3\text{CHOHCH}_2\text{OH}$

Q.93 In the following reaction



Product will be

- (1) >CCH (2) >CH_2
 (3) $\text{>C}\equiv\text{CH}$ (4) $\text{>C}\equiv\text{C-CH}_3$

Q.94 Isobutylmagnesium bromide in dry ether on reaction with absolute alcohol gives

- (1) $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$ and $\text{CH}_3\text{CH}_2\text{MgBr}$
 (2) $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_2\text{CH}_3$ and Mg(OH)Br
 (3) $(\text{CH}_3)_2\text{CHCH}_3$ and $\text{CH}_3\text{CH}_2\text{OMgBr}$
 (4) $(\text{CH}_3)_3\text{CH}$, $\text{CH}_2=\text{CH}_2$ and Mg(OH)Br

Q.95 Which of the following will give a yellow precipitate of iodoform on heating with I_2 and NaOH ?

- (1) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{C}-\text{CH}_3 \\ | \\ \text{OH} \end{array}$
 (2) $\begin{array}{c} \text{Ph}-\text{CH}-\text{CH}_2-\text{CH}_3 \\ | \\ \text{OH} \end{array}$
 (3) $\begin{array}{c} \text{O} \quad \text{O} \\ || \quad || \\ \text{CH}_3-\text{C}-\text{O}-\text{C}-\text{CH}_3 \end{array}$
 (4) $\begin{array}{c} \text{I}_2\text{HC}-\text{C}-\text{CH}_2-\text{CH}_3 \\ || \\ \text{O} \end{array}$

Q.96 In which of the following cases will the product of the reaction respond positively to the iodoform test ?

- (1) $(\text{CH}_3)_2\text{C}=\text{CH}_2 \xrightarrow[\text{heat}]{\text{H}_2\text{O}^+}$
 (2) $\text{CH}_3-\text{CH}=\text{CH}_2 \xrightarrow[2.\text{H}_2\text{O}_2/\text{OH}^-]{1.\text{B}_2\text{H}_6}$
 (3) $\text{CH}_3-\text{C}\equiv\text{CH} \xrightarrow[2.\text{H}_2\text{O}_2/\text{OH}^-]{1.\text{B}_2\text{H}_6}$
 (4) $\text{CH}_3-\text{C}\equiv\text{C}-\text{CH}_3 \xrightarrow[\text{Hg}^{2+}]{\text{H}_2\text{O}}$

Q.97 Which of the following reactions is expected to take place by $\text{S}_{\text{N}}2$ mechanism ?

- (1) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{CH}_2-\text{C}-\text{Br} \\ | \\ \text{CH}_3 \end{array} + \text{AgOH} \xrightarrow{\text{H}_2\text{O}}$
 (2) $(\text{CH}_3)_3\text{C-Br} + \text{KOH} \xrightarrow{\text{H}_2\text{O}}$
 (3) $\text{CH}_3\text{CH}_2\text{CHBrCH}_3 + \text{CH}_3\text{CO}_2\text{Na} \xrightarrow{\text{CH}_3\text{CO}_2\text{H}}$
 (4) $(\text{CH}_3)_2\text{CHBr} + \text{AgCN} \xrightarrow{\text{dimethylsulphoxide}}$

Q.98 Finkelstein reaction is -

- (1) $2\text{CH}_3\text{CH}_2\text{Cl} + \text{Ag}_2\text{O (dry)} \longrightarrow \text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3 + 2\text{AgCl}$
 (2) $\text{CH}_3\text{CH}_2\text{Br} + \text{NaI} \xrightarrow{\text{Acetone}} \text{CH}_3\text{CH}_2\text{I} + \text{NaBr}$
 (3) $\text{CH}_3\text{CH}_2\text{Br} + \text{Ag}_2\text{O (moist)} \longrightarrow \text{CH}_3\text{CH}_2\text{OH} + \text{AgBr}$
 (4) $\text{CH}_3\text{CH}_2\text{Cl} + \text{NaOCH}_3 \longrightarrow \text{CH}_3\text{CH}_2\text{OCH}_3 + \text{NaCl}$

Q.99 An alkyl bromide (A) forms Grignard's reagent which on treatment with water yields n-Hexane.

(A) with sodium /ether forms 4, 5-diethyl octane.
 (A) is -

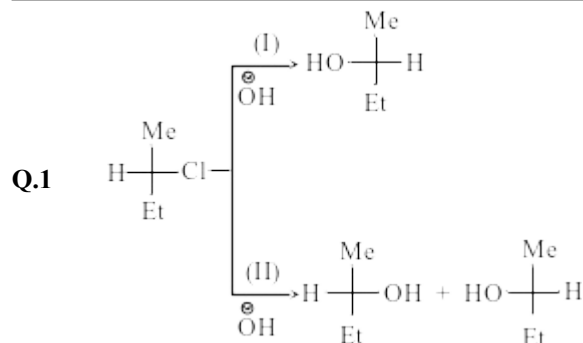
- (1) $\text{CH}_3(\text{CH}_2)_5\text{Br}$
 (2) $\text{CH}_3(\text{CH}_2)_3\text{CH(Br)CH}_3$
 (3) $\text{CH}_3-(\text{CH}_2)_2-\text{CH(Br)CH}_2\text{CH}_3$
 (4) $\text{CH}_3(\text{CH}_2)_2\text{CH(Br)CH}=\text{CH}_2$

Q.100 Pick out the incorrect reaction -

- (1) $\text{CH}_3\text{CH}=\text{CH}_2 + \text{HCl} \longrightarrow \text{CH}_3\text{CHClCH}_3$
 (2) $\text{CH}_3\text{CH}=\text{CH}_2 + \text{HBr} \longrightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$
 (3) $\text{CH}_3\text{CH}=\text{CH}_2 + \text{HBr} \xrightarrow{\text{Peroxide}} \text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$
 (4) $\text{CH}_3\text{CH}=\text{CH}_2 + \text{HI} \xrightarrow{\text{Peroxide}} \text{CH}_3\text{CHICH}_3$

EXERCISE # 2

(BRAIN TWISTERS OF HALOALKANE)



- (1) both S_N1 (2) both S_N2
 (3) I S_N1 , II S_N2 (4) I S_N2 , II S_N1

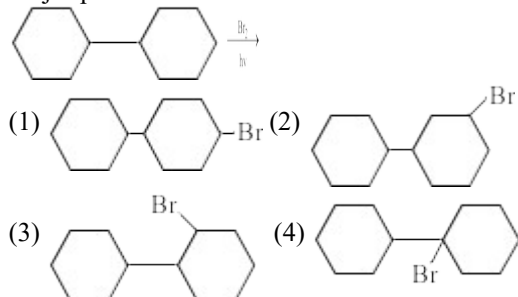
Q.2 Which will give white ppt. with $AgNO_3$?

- (1) (2)
 (3) (4) Both (1) & (3)

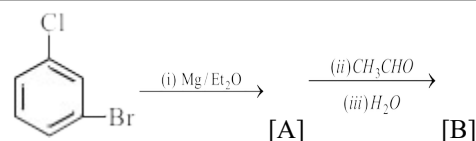
Q.3 The compound which gives negative iodoform test is -

- (1)
 (2)
 (3)
 (4)

Q.4 Major product for the reaction is -

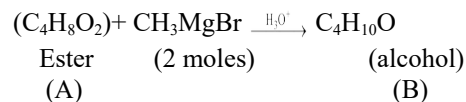


Q.5 What are (A) & (B) in the following reaction ?



- (1) &
 (2) &
 (3) &
 (4) None of these

Q.6

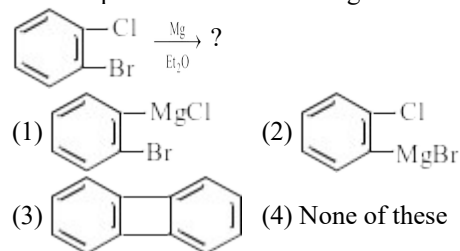


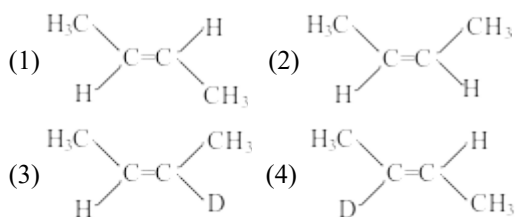
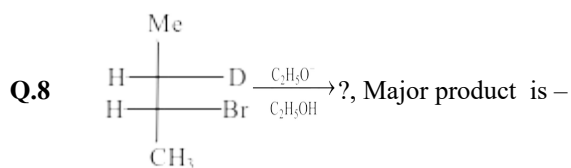
Alcohol (B) reacts slowly with sodium metal. Hence (A) and (B) are -

- (1) ,
 (2) ,
 (3) ,
 (4) ,

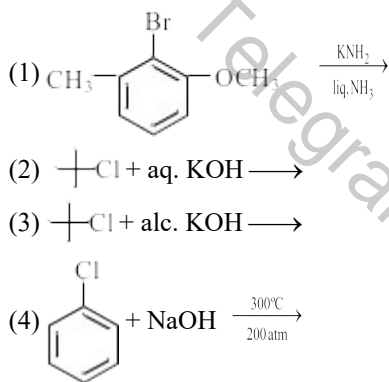
Q.7

What is product of the following reaction ?

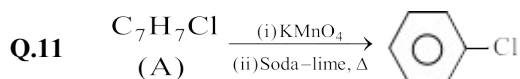
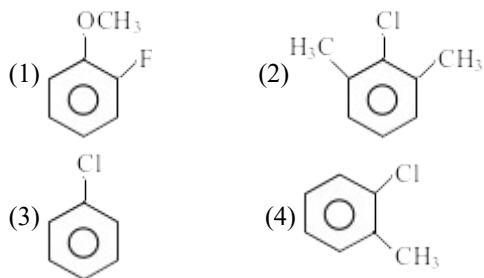




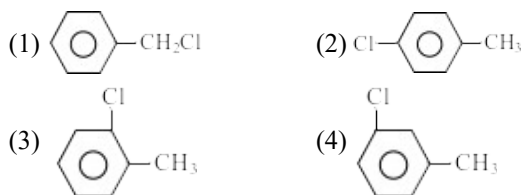
Q.9 Which of the following reaction does not take place ?



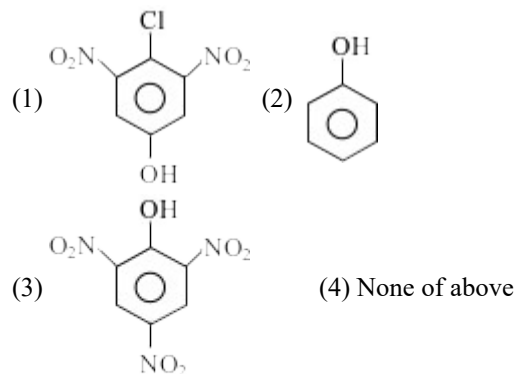
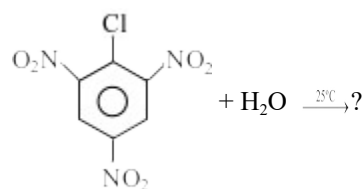
Q.10 Benzyne intermediate is not observed in –



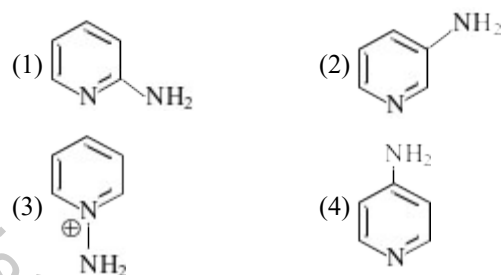
(A) In the above reactions, compound (A) can not be –



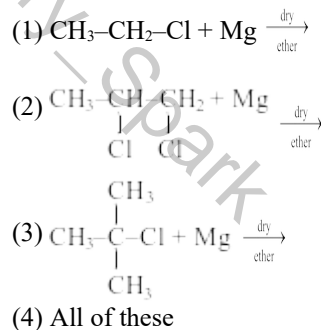
Q.12 The product of the following reaction is –



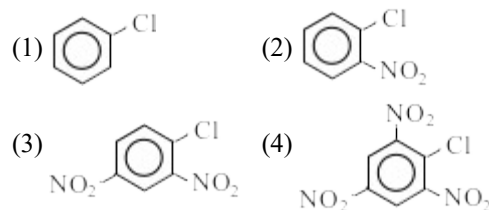
Q.13  $\xrightarrow[\Delta]{\text{NaNH}_2}$ X. What is X –



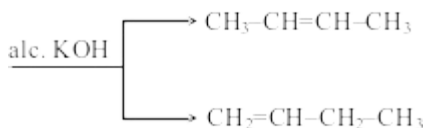
Q.14 Grignard reagent can be prepared by –



Q.15 Which of the following undergoes hydrolysis most easily –

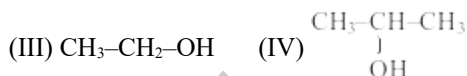
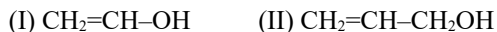


Q.16 For the reaction $\text{CH}_3\text{CH}(\text{X})\text{CH}_2\text{CH}_3$



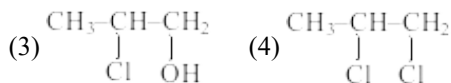
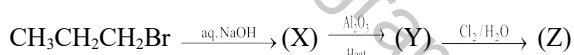
- (1) $\text{CH}_3\text{-CH=CH-CH}_3$ predominates
 (2) $\text{CH}_2\text{=CH-CH}_2\text{-CH}_3$ predominates
 (3) Both are formed in equal amounts
 (4) The product ratio is dependent on the halogen X

Q.17 The correct reactivity order of alcohols towards H-X will be



- (1) $\text{II} > \text{I} > \text{III} > \text{IV}$ (2) $\text{IV} > \text{III} > \text{II} > \text{I}$
 (3) $\text{II} > \text{IV} > \text{I} > \text{III}$ (4) $\text{II} > \text{IV} > \text{III} > \text{I}$

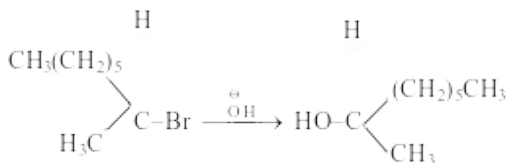
Q.18 Identify (Z) in the following reaction series,



Q.19 A compound (A) formula of $\text{C}_3\text{H}_6\text{Cl}_2$ on reaction with alkali can give (B) of formula $\text{C}_3\text{H}_6\text{O}$ or (C) of formula C_3H_4 . (B) on oxidation gave a compound of the formula $\text{C}_3\text{H}_6\text{O}_2$. (C) with dilute H_2SO_4 containing Hg^{2+} ion gave (D) of formula $\text{C}_3\text{H}_6\text{O}$, which with bromine and alkali gave the sodium salt of $\text{C}_2\text{H}_4\text{O}_2$. Then (A) is –

- (1) $\text{CH}_3\text{CH}_2\text{CHCl}_2$ (2) $\text{CH}_3\text{CCl}_2\text{CH}_3$
 (3) $\text{CH}_2\text{ClCH}_2\text{CH}_2\text{Cl}$ (4) $\text{CH}_3\text{CHClCH}_2\text{Cl}$

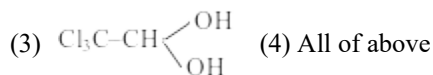
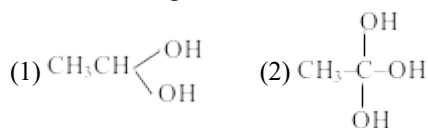
Q.20 Following reaction is –



- (1) E^1 (2) SN^1

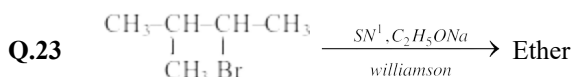
- (3) E^2 (4) SN^2

Q.21 A compound containing two-OH groups attached with one carbon atoms is unstable but which one of the following is stable –

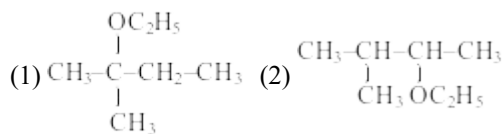


Q.22 1-phenyl-2-chloropropane on treating with alc. KOH given mainly –

- (1) 1-phenylpropene
 (2) 2-phenylpropene
 (3) 1-phenylpropane-2-ol
 (4) 1-phenylpropan-1-ol



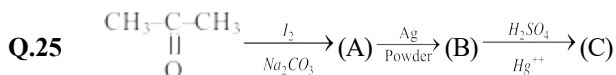
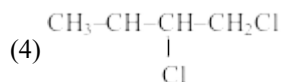
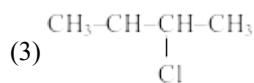
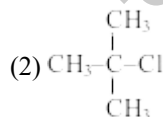
Product ether is –



- (3) Both (1) and (2) (4) None is correct

Q.24 An organic compound on treatment with alcoholic KOH gives a hydrocarbon of a molecular formula C_4H_8 . Oxidation of the hydrocarbon gives propionic acid and CO_2 . The organic compound should be –

- (1) $\text{C}_2\text{H}_5\text{-CH}_2\text{-CH}_2\text{Cl}$

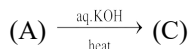
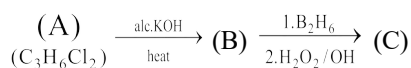


Product A, B & C are –

- (1) Iodoform, Acetylene & Acetaldehyde
 (2) Triiodomethane, Ethyne & Acetone
 (3) Iodoform, Ethene & Ethylene glycol

(4) Ethene, iodoform & Ethylhydrogen sulphate

Q.26 Consider the following sequence of reactions.



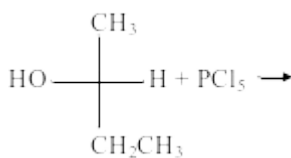
The compound (A) is -

- (1) $\text{CH}_3\text{CH}_2\text{CHCl}_2$ (2) $\text{CH}_3\text{CCl}_2\text{CH}_3$
(3) $\text{CH}_3\text{CHClCH}_2\text{Cl}$ (4) $\text{ClCH}_2\text{CH}_2\text{CH}_2\text{Cl}$

Q.27 A compound (X), $\text{C}_4\text{H}_8\text{Cl}_2$, on hydrolysis with aqueous KOH gives a product (Y) which on heating with I_2 and dilute NaOH gives a yellow precipitate of iodoform. The compound (X) is -
(1) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHCl}_2$ (2) $\text{CH}_3\text{CH}_2\text{CHClCH}_2\text{Cl}$
(3) $\text{CH}_3\text{CH}_2\text{CCl}_2\text{CH}_3$ (4) $\text{ClCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$

Q.28 An aromatic primary amine (A) is heated with another compound (B) in the presence of alcoholic KOH to give a bad-smelling compound having the formula $\text{C}_6\text{H}_5\text{NC}$. The compound (B) can be prepared by heating another compound (C) with chlorine and slaked lime. The compound (C) is -
(1) $\text{C}_6\text{H}_5\text{NH}_2$ (2) $\text{C}_2\text{H}_5\text{OH}$
(3) CHCl_3 (4) CH_3OCH_3

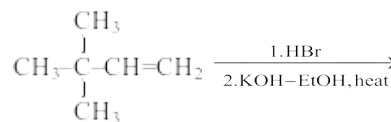
Q.29 Consider the following reaction



The product formed is -

- (1) $\begin{array}{c} \text{Cl} \\ | \\ \text{CH}_3-\text{C}-\text{H} \\ | \\ \text{CH}_2\text{CH}_3 \end{array}$ (2) $\begin{array}{c} \text{CH}_2\text{CH}_3 \\ | \\ \text{H}-\text{C}-\text{Cl} \\ | \\ \text{CH}_3 \end{array}$
(3) $\begin{array}{c} \text{CH}_3 \\ \diagup \\ \text{C}=\text{C} \\ \diagdown \\ \text{H} \end{array}$ (4) $\begin{array}{c} \text{CH}_3 \\ \diagup \\ \text{C}=\text{O} \\ \diagdown \\ \text{CH}_3\text{CH}_2 \end{array}$

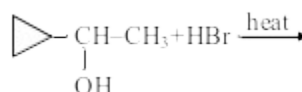
Q.30 Consider the following reaction sequence.



The major end product formed is

- (1) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{C}-\text{CH}-\text{CH}_3 \\ | \quad | \\ \text{CH}_3 \quad \text{OH} \end{array}$ (2) $\begin{array}{c} \text{H}_3\text{C} \quad \text{CH}_3 \\ | \quad | \\ \text{CH}_3-\text{C}-\text{CH}-\text{CH}_3 \\ | \\ \text{OC}_2\text{H}_5 \end{array}$
(3) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{C}-\text{CH}=\text{CH}_2 \\ | \\ \text{CH}_3 \end{array}$ (4) $\begin{array}{c} \text{CH}_3-\text{C}=\text{C}-\text{CH}_3 \\ | \quad | \\ \text{CH}_3 \quad \text{CH}_3 \end{array}$

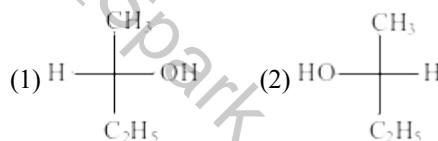
Q.31 In the reaction



the major product formed is

- (1) $\triangle-\text{CHCH}_3$ (2) $\triangle-\text{CH}_2\text{CH}_3$
| | |
Br Br Br
(3) $\square-\text{CH}_3$ (4) $\square-\text{CH}_3$
| |
Br Br

Q.32 (R)-2-Bromobutane is allowed to react with aqueous KOH. Identify the product formed in the reaction.

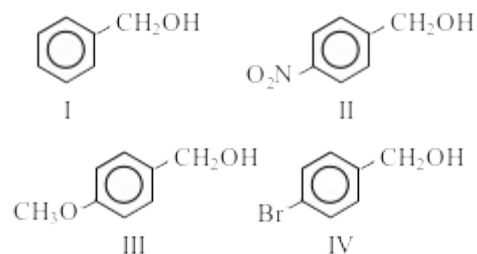


- (3) Equimolar amounts of (1) and (2)
(4) Slight excess of (2)

Q.33 The order of decreasing nucleophilicities of the following species is

- (1) $\text{CH}_3\text{S}^\ominus > \text{CH}_3\text{O}^\ominus > \text{CH}_3\text{COO}^\ominus > \text{CH}_3\text{OH}$
(2) $\text{CH}_3\text{COO}^\ominus > \text{CH}_3\text{S}^\ominus > \text{CH}_3\text{O}^\ominus > \text{CH}_3\text{OH}$
(3) $\text{CH}_3\text{OH} > \text{CH}_3\text{S}^\ominus > \text{CH}_3\text{COO}^\ominus > \text{CH}_3\text{O}^\ominus$
(4) $\text{CH}_3\text{O}^\ominus > \text{CH}_3\text{OH} > \text{CH}_3\text{COO}^\ominus > \text{CH}_3\text{S}^\ominus$

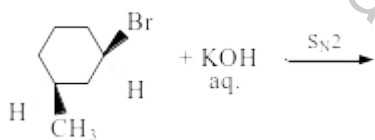
Q.34 Consider the following alcohols.



The order of decreasing reactivities of these alcohols towards nucleophilic substitution with HBr is -

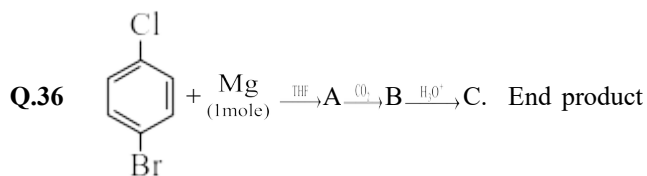
- (1) III > I > IV > II (2) III > I > II > IV
(3) I > III > IV > II (4) I > III > II > IV

Q.35 Consider the following reaction of (1R, 3S)-cis-1-Bromo-3-methylcyclohexane

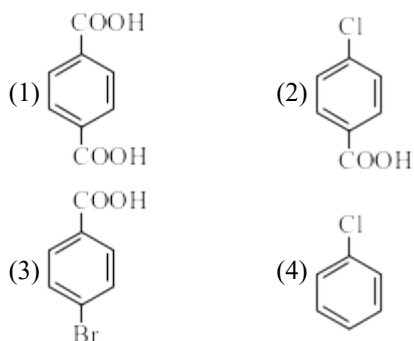


The product formed in the reaction is -

- (1) (1R, 3S)-cis-3-methylcyclohexanol
(2) (1S, 3R)-cis-3-methylcyclohexanol
(3) (1S, 3S)-trans-3-methylcyclohexanol
(4) (1R, 3R)-trans-3-methylcyclohexanol



C is -



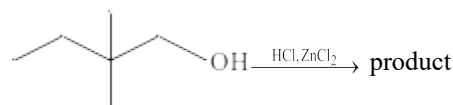
Q.37



product A is -

- (1) (2)
(3) (4)

Q.38 Identify the product-



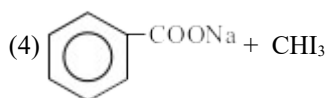
- (1) (2)
(3) (4)

Q.39



B and C are -

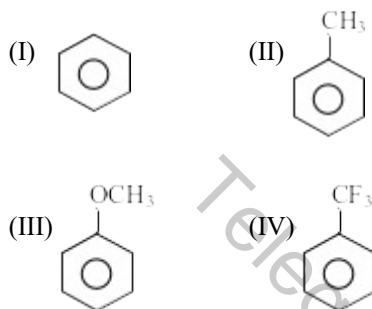
- (1) + (2) +
(3) +



EXERCISE # 3A

(AIPMT & AIIMS QUESTIONS)

Q.1 Increasing order of electrophilic substitution for following compounds - [AIPMT]



- (1) $\text{IV} < \text{I} < \text{II} < \text{III}$ (2) $\text{III} < \text{II} < \text{I} < \text{IV}$
 (3) $\text{I} < \text{IV} < \text{III} < \text{II}$ (4) $\text{II} < \text{III} < \text{I} < \text{IV}$

Q.2 In FCR, Toluene can be prepared by

[AIPMT]

- (1) $\text{C}_6\text{H}_6 + \text{CH}_3\text{Cl}$ (2) $\text{C}_6\text{H}_5\text{Cl} + \text{CH}_4$
 (3) $\text{C}_6\text{H}_6 + \text{CH}_2\text{Cl}_2$ (4) $\text{C}_6\text{H}_6 + \text{CH}_3\text{COCl}$

Q.3 $\text{CH}_3-\text{CH}_2-\underset{\text{Cl}}{\text{CH}}-\text{CH}_3$ obtained by chlorination of n-butane, will be - [AIPMT]

- (1) Meso form (2) Racemic mixture
 (3) d-form (4) l-form

Q.4 An organic compound $\text{A}(\text{C}_4\text{H}_9\text{Cl})$ on reaction with Na/diethyl ether gives a hydrocarbon which on monochlorination gives only one chloro derivative than, A is [AIPMT]

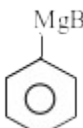
- (1) t-butyl chloride (2) Sec. butyl chloride
 (3) Iso butyl chloride (4) n-butyl chloride

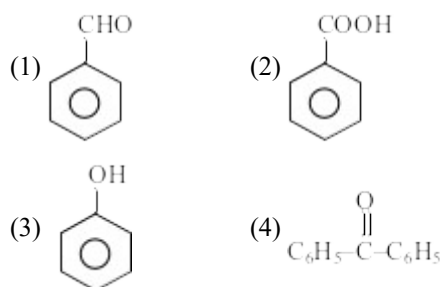
Q.5 Reactivity order of halides for dehydrohalogenation is - [AIPMT]

- (1) $\text{R-F} > \text{R-Cl} > \text{R-Br} > \text{R-I}$
 (2) $\text{R-I} > \text{R-Br} > \text{R-Cl} > \text{R-F}$

(3) $\text{R-I} > \text{R-Cl} > \text{R-Br} > \text{R-F}$

(4) $\text{R-F} > \text{R-I} > \text{R-Br} > \text{R-Cl}$

Q.6  $\xrightarrow[\text{(ii) H}_3\text{O}^+]{\text{(i) CO}_2}$ P, In the above reaction product 'P' is [AIPMT]



Q.7 When $\text{CH}_3\text{CH}_2\text{CHCl}_2$ is treated with NaNH_2 , the product formed is : [AIPMT]

- (1) $\text{CH}_3-\text{CH}=\text{CH}_2$ (2) $\text{CH}_3-\text{C}\equiv\text{CH}$
 (3) $\text{CH}_3\text{CH}_2\text{CH} \begin{matrix} \text{NH}_2 \\ \text{NH}_2 \end{matrix}$ (4) $\text{CH}_3\text{CH}_2\text{CH} \begin{matrix} \text{Cl} \\ \text{NH}_2 \end{matrix}$

Q.8 The correct order of reactivity towards the electrophilic substitution of the compounds aniline (I), benzene (II) and nitrobenzene (III) is [AIPMT]

- (1) $\text{III} > \text{II} > \text{I}$ (2) $\text{II} > \text{III} > \text{I}$
 (3) $\text{I} < \text{II} > \text{III}$ (4) $\text{I} > \text{II} > \text{III}$

Q.9 The treatment of benzene with isobutene in the presence of sulphuric acid gives [AIIMS]

- (1) Isobutyl benzene (2) t-butyl benzene
 (3) n-Butyl benzene (4) No reaction

Q.10 Which of the following compounds possesses the C-H bond with the lowest bond dissociation energy [AIIMS]

- (1) Toluene. (2) Benzene
 (3) n-Pentane (4) 2, 2-Dimethyl propane

Q.11 Among the following the most reactive towards alcoholic KOH is [AIIMS]

- (1) $\text{CH}_2=\text{CHBr}$ (2) $\text{CH}_3\text{COCH}_2\text{CH}_2\text{Br}$
 (3) $\text{CH}_3\text{CH}_2\text{Br}$ (4) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$

Q.12 Among the following, the one which reacts most readily with ethanol is [AIIMS]

- (1) p-nitro benzyl bromide
- (2) p-chloro benzyl bromide
- (3) p-methoxy benzyl bromide
- (4) p-methyl benzyl bromide

Q.13 Which of the following is least reactive in a nucleophilic substitution reaction [AIPMT]

- (1) $\text{CH}_2=\text{CHCl}$
- (2) $\text{CH}_3\text{CH}_2\text{Cl}$
- (3) $\text{CH}_2=\text{CHCH}_2\text{Cl}$
- (4) $(\text{CH}_3)_3\text{C}-\text{Cl}$

Q.14 The major product obtained on treatment of $\text{CH}_3\text{CH}_2\text{CH}(\text{F})\text{CH}_3$ with $\text{CH}_3\text{O}^-/\text{CH}_3\text{OH}$ is – [AIIMS]

- (1) $\text{CH}_3\text{CH}_2\text{CH}(\text{OCH}_3)\text{CH}_3$
- (2) $\text{CH}_3\text{CH}=\text{CHCH}_3$
- (3) $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$
- (4) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OCH}_3$

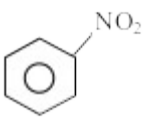
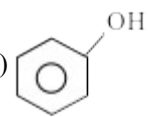
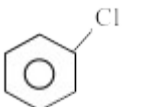
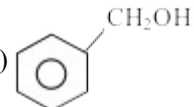
Q.15 Which of the following undergoes nucleophilic substitution exclusively by $\text{S}_\text{N}1$ mechanism [AIPMT]

- (1) Ethyl chloride
- (2) Isopropyl chloride
- (3) Benzyl chloride
- (4) Chloro benzene

Q.16 In a $\text{S}_\text{N}2$ substitution reaction of the type $\text{R}-\text{Br} + \text{Cl}^- \xrightarrow{\text{DME}} \text{R}-\text{Cl} + \text{Br}^-$, which one of the following has the highest relative rate? [AIPMT-2008]

- (1) $\text{CH}_3-\text{CH}(\text{CH}_3)-\text{CH}_2\text{Br}$
- (2) $\text{CH}_3-\text{C}(\text{CH}_3)_2-\text{CH}_2\text{Br}$
- (3) $\text{CH}_3-\text{CH}_2\text{Br}$
- (4) $\text{CH}_3-\text{CH}_2-\text{CH}_2\text{Br}$

Q.17 Which one of the following is most reactive towards electrophilic attack? [AIPMT-2008]

- (1) 
- (2) 
- (3) 
- (4) 

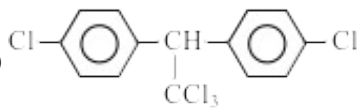
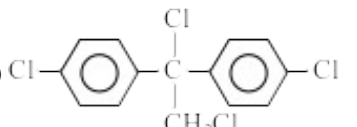
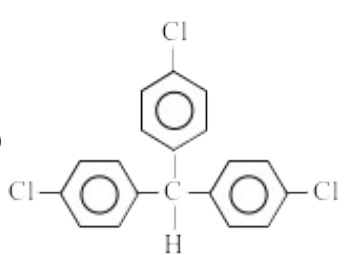
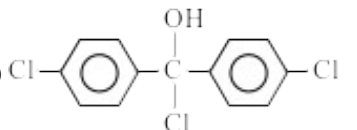
Q.18 Which of the following reactions is an example of nucleophilic substitution reaction? [AIPMT-2009]

- (1) $\text{RX} + \text{Mg} \rightarrow \text{RMgX}$
- (2) $\text{RX} + \text{KOH} \rightarrow \text{ROH} + \text{KX}$

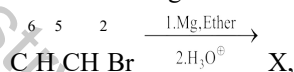
(3) $2\text{RX} + 2\text{Na} \rightarrow \text{R}-\text{R} + 2\text{NaX}$

(4) $\text{RX} + \text{H}_2 \rightarrow \text{RH} + \text{HX}$

Q.19 Trichloroacetaldehyde, CCl_3CHO reacts with chlorobenzene in presence of sulphuric acid and produces – [AIPMT]

- (1) 
- (2) 
- (3) 
- (4) 

Q.20 In the following reaction

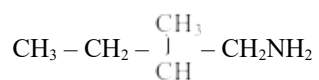


the product 'X' is – [AIPMT MAINS-2010]

- (1) $\begin{array}{c} 6 & 5 & 2 \\ \text{C} & \text{H} & \text{CH} & \text{OH} \end{array}$
- (2) $\text{C}_6\text{H}_5\text{CH}_3$
- (3) $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{CH}_2\text{C}_6\text{H}_5$
- (4) $\text{C}_6\text{H}_5\text{CH}_2\text{OCH}_2\text{C}_6\text{H}_5$

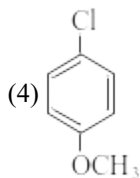
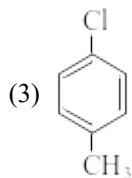
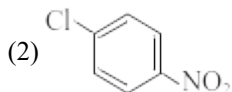
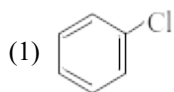
Q.21 Which one is a nucleophilic substitution reaction among the following? [AIPMT-2011]

- (1) $\text{CH}_3\text{CHO} + \text{HCN} \rightarrow \text{CH}_3\text{CH}(\text{OH})\text{CN}$
- (2) $\text{CH}_3-\text{CH}=\text{CH}_2 + \text{H}_2\text{O} \xrightarrow{\text{H}^+} \begin{array}{c} \text{CH}_3-\text{CH}-\text{CH}_3 \\ | \\ \text{OH} \end{array}$
- (3) $\text{RCHO} + \text{R}'\text{MgX} \rightarrow \begin{array}{c} \text{R}-\text{CH}-\text{R}' \\ | \\ \text{OH} \end{array}$
- (4) $\text{CH}_3-\text{CH}_2-\text{C}(\text{CH}_3)_2-\text{CH}_2\text{Br} + \text{NH}_3 \rightarrow$

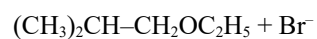
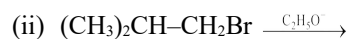
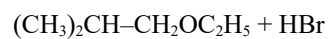
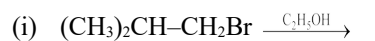


Q.22 Which of the following compounds undergoes nucleophilic substitution reaction most easily ?

[AIPMT MAINS-2013]



[AIPMT MAINS-2016]



The mechanisms of reactions (i) and (ii) are respectively :



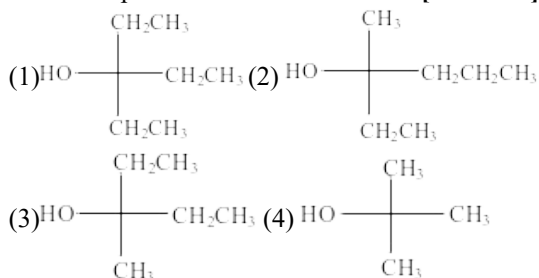
Q.23 Consider the reactions :

EXERCISE # 3B

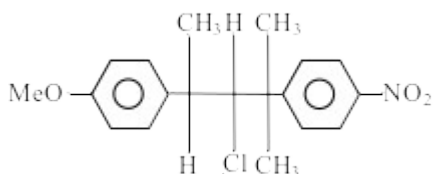
(OTHER EXAM QUESTIONS)

- Q.1** Etheral solution of methyl iodide and ethyl iodide in presence of metallic sodium gives -
[RPMT-2003]
(1) Methane (2) Propane
(3) Methanol (4) Propene
- Q.2** Which gives maximum yield of C_2H_5Cl
[RPMT-2004]
(1) $C_2H_6 + Cl_2 \xrightarrow{hv, light} C_2H_5Cl + HCl$
(excess)
(2) $C_2H_6 + Cl_2 \xrightarrow{light} C_2H_5Cl + HCl$
(excess)
(3) $C_2H_6 + Cl_2 \xrightarrow{hv, light} C_2H_5Cl + HCl$
(4) $C_2H_6 + Cl_2 \xrightarrow{Dark} C_2H_5Cl + HCl$
- Q.3** The least reactive chlorine is present in -
[RPMT-2005]
(1) Methyl chloride (2) Allyl chloride
(3) Ethyl chloride (4) Vinyl chloride
- Q.4** The reaction is a
 $(CH_3)_3 CBr + H_2O \longrightarrow (CH_3)_3 COH + HBr$
[AIEEE-2002]
(1) Substitution reaction
(2) Debromination reaction
(3) Rearrangement reaction
(4) Elimination reaction
- Q.5** The correct order of the thermal stability of hydrogen halides ($H - X$) is - [AIEEE-2005]
(1) $HF > HCl > HBr > HI$
(2) $HI > HBr > HCl > HF$
(3) $HI > HCl < HF > HBr$
(4) $HCl < HBr > HBr < HI$
- Q.6** Tertiary alkyl halides are practically inert to substitution by S_N2 mechanism because of -
[AIEEE-2005]
(1) instability (2) insolubility
(3) steric hindrance (4) inductive effect
- Q.7** Alkyl halides react with dialkyl copper reagents to give - [AIEEE-2005]
(1) alkyl copper halides
(2) alkenes
(3) alkenyl halides
(4) alkanes
- Q.8** Elimination of HBr from 2-bromobutane results in the formation of - [AIEEE-2005]
(1) predominantly 2-butene
(2) equimolar mixture of 1 and 2-butene
(3) predominantly 2-butyne
(4) predominantly 1-butene
- Q.9** Among the following the one that gives positive iodoform upon reaction with I_2 and $NaOH$ is - [AIEEE-2006]
(1) $C_6H_5CH_2CH_2OH$
(2) $\begin{array}{c} CH_3 \\ | \\ CH_3-CH-CH_2OH \end{array}$
(3) $PhCHOHCH_3$
(4) $CH_3CH_2CH(OH)CH_2CH_3$
- Q.10** Which of the following is the correct order of decreasing S_N2 reactivity? [AIEEE-2007]
(1) $RCH_2X > R_3CX > R_2CHX$
(2) $RCH_2X > R_2CHX > R_3CX$
(3) $R_3CX > R_2CHX > RCH_2X$
(4) $R_2CHX > R_3CX > RCH_2X$
(X = a halogen)
- Q.11** The organic chloro compound, which shows complete stereochemical inversion during a S_N2 reaction, is - [AIEEE-2008]
(1) $(CH_3)_3CCl$ (2) $(CH_3)_2CHCl$
(3) CH_3Cl (4) $(C_2H_5)_2CHCl$
- Q.12** The order of reactivity of the following alkyl halides for a S_N2 reaction is - [IIT-2000]
(1) $RF > RCl > R-Br > R-I$
(2) $R-F > R-Br > R-Cl > R-I$
(3) $R-Cl > R-Br > RF > RI$
(4) $R-I > R-Br > R-Cl > R-F$
- Q.13** Identify the set of reagents/reaction conditions 'X' and 'Y' in the following set of transformations
[IIT-2002]
 $CH_3CH_2-CH_2Br \xrightarrow{X} \text{Product} \xrightarrow{Y} \begin{array}{c} CH_3-CH-CH_3 \\ | \\ Br \end{array}$
(1) X = dilute aqueous $NaOH$, $20^\circ C$;
Y = HBr /acetic acid, $20^\circ C$
(2) X = concentrated alcoholic $NaOH$, $80^\circ C$
Y = HBr /acetic acid, $20^\circ C$
(3) X = dilute aqueous $NaOH$, $20^\circ C$;
Y = $Br_2/CHCl_3$, $0^\circ C$
(4) X = concentrated alcoholic $NaOH$, $80^\circ C$
Y = $Br_2/CHCl_3$, $0^\circ C$

- Q.14** CH_3MgBr (excess) + Ethyl ester \rightarrow which can be formed as product. [IIT-2003]

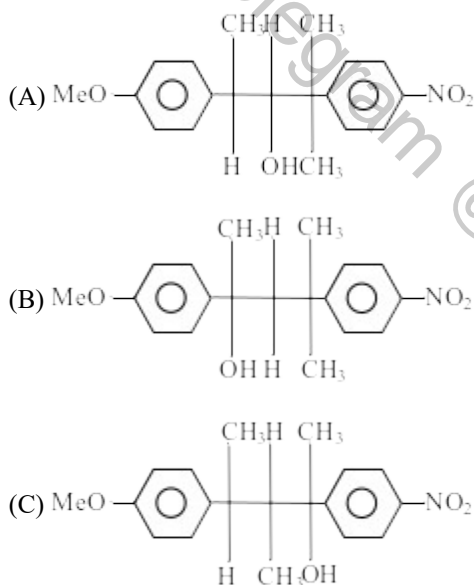


Q.15



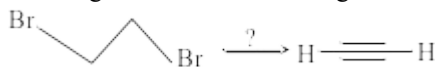
[IIT-2005]

on hydrolysis in presence of acetone ?



- (1) A & B (2) only B
 (3) C only (4) A & C

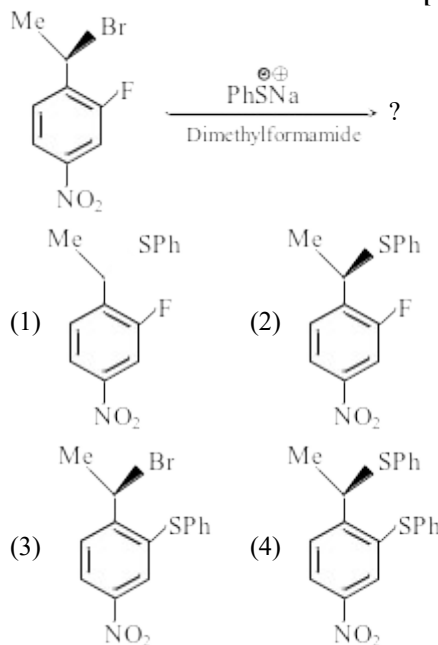
- Q.16** The reagent in for the following conversion is/are



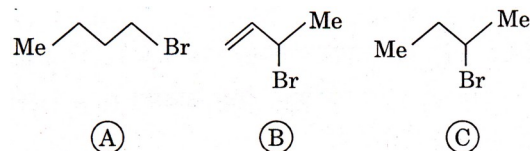
[IIT - 2007]

- (1) alcoholic KOH
 (2) Alcoholic KOH followed by NaNH_2
 (3) aqueous KOH followed by NaNH_2
 (4) $\text{Zn}/\text{CH}_3\text{OH}$

- Q.17** The major product of the following reaction is - [IIT-2008]



- Q.18** Consider the following bromides [AIEEE-2010]



The correct order of $\text{S}_\text{N}1$ reactivity is

- (1) $\text{A} > \text{B} > \text{C}$ (2) $\text{B} > \text{C} > \text{A}$
 (3) $\text{B} > \text{A} > \text{C}$ (4) $\text{C} > \text{B} > \text{A}$

- Q.19** The total number of alkenes possible by dehydrobromination of 3-bromo-3-cyclopentylhexane using alcoholic KOH is.

[IIT-2011]

- (1) 3 (2) 4 (3) 5 (4) 6

- Q.20** By heating which mixture, propane nitrile will be obtained ? [RPMT-2011]

- (1) Ethyl alcohol + KCN
 (2) Propyl alcohol + KCN
 (3) Ethyl chloride + KCN
 (4) Propyl chloride + KCN

- Q.21** Major product of the reaction $(\text{CH}_3)_3\text{C}-\text{Cl} + \text{C}_2\text{H}_5\text{ONa} \longrightarrow$ would be - [RPMT-2011]

- (1) $(\text{CH}_3)_2\text{C}-\text{OC}_2\text{H}_5$ (2) $(\text{CH}_3)_3\text{C}-\text{C}_2\text{H}_5$
 (3) $(\text{CH}_3)_2\text{C}=\text{CH}_2$ (4) $\text{CH}_3-\text{CH}=\text{CH}-\text{C}_2\text{H}_5$

- Q.22** $\text{C}_2\text{H}_5\text{Cl} \xrightarrow{\text{NH}_3} \text{'A'} \xrightarrow{\text{C}_2\text{H}_5\text{Cl}} \text{'B'} \xrightarrow{\text{C}_2\text{H}_5\text{Cl}} \text{'C'}$

A, B and C respectively are - [RPMT-2011]

- (1) $\text{C}_2\text{H}_5\text{NH}_2$, $(\text{C}_2\text{H}_5)_2\text{NH}$, $(\text{C}_2\text{H}_5)_3\text{N}$
 (2) $\text{C}_2\text{H}_5\text{NH}_2$, $\text{C}_2\text{H}_5\text{NH}-\text{Cl}$, $\text{C}_2\text{H}_5-\text{NCl}_2$
 (3) $\text{C}_2\text{H}_5\text{NH}_2$, $\text{CH}_2=\text{CH}_2$, $\text{Cl}-\text{CH}_2-\text{CH}_2-\text{C}_2\text{H}_5$
 (4) $\text{C}_2\text{H}_5\text{NH}_2$, $(\text{C}_2\text{H}_5)_3\text{N}$, $(\text{C}_2\text{H}_5)_2\text{NH}$

EXERCISE # 4

(ASSERTION & REASON TYPE QUESTIONS)

These questions consist of two statements each, printed as Assertion and Reason. While answering these Questions you are required to choose any one of the following four responses.

- (A) If both Assertion & Reason are True & the Reason is a correct explanation of the Assertion
 (B) If both Assertion & Reason are True but Reason is not a correct explanation of the Assertion
 (C) If Assertion is True but the Reason is False
 (D) If both Assertion & Reason are False

Q.1 **Assertion :** Aryl halides are more reactive than alkyl halide towards SN_2 .

Reason : Intermediate carbocation is more stable obtained from Aryl halide.

- (1) A (2) B (3) C (4) D

Q.2 **Assertion :** CHCl_3 is filled in dark coloured bottles upto top level of the bottle.

Reason : CHCl_3 gives phosgene when contacts with air.

- (1) A (2) B (3) C (4) D

Q.3 **Assertion :** CHI_3 gives yellow ppt. with AgNO_3 while CHCl_3 does not give any ppt.

Reason : CHCl_3 is colourless liquid while CHI_3 is yellowish solid.

- (1) A (2) B (3) C (4) D

Q.4 **Assertion :** Alkyl halides are not soluble in water.

Reason : Alkyl halides do not form H-bonds with water molecule although alkyl halide is polar in nature.

- (1) A (2) B (3) C (4) D

Q.5 **Assertion :** CHCl_3 is more acidic than CHF_3 .

Reason : Electronegativity of Fluorine is more than chlorine.

- (1) A (2) B (3) C (4) D

Q.6 **Assertion :** Benzyl bromide when kept in acetone water it produces benzyl alcohol.

Reason : The reaction follows SN^2 mechanism.

[AIIMS-2003]

- (1) A (2) B (3) C (4) D

Q.7 **Assertion :** Isobutanol does not give iodoform test.

Reason : It does not have α -hydrogen.

[AIIMS-2004]

- (1) A (2) B (3) C (4) D

Q.8 **Assertion :** Styrene on reaction with HBr gives 1-bromo-1-phenyl-ethane.

Reason : Benzyl radical is more stable than alkyl radical.

[AIIMS-2004]

- (1) A (2) B (3) C (4) D

Q.9 **Assertion :** 2-Bromobutane on reaction with sodium ethoxide in ethanol gives 1-butene as a major product.

Reason : 1-Butene is more stable than 2-butene.

- (1) A (2) B (3) C (4) D

Q.10 **Assertion :** Rate of hydrolysis of methyl chloride to methanol is higher in DMF than in water.

Reason : Hydrolysis of methyl chloride follows second order kinetics.

[AIIMS-2005]

- (1) A (2) B (3) C (4) D

Q.11 **Assertion :** Rates of nitration of benzene and hexadeuterobenzene are different.

Reason : C-H bond is stronger than C-D bond.

[AIIMS-2005]

- (1) A (2) B (3) C (4) D

Q.12 **Assertion :** Neopentyl alcohol on treatment with conc. HCl gives neopentyl chloride.

Reason : Less stable 1° and 2° carbocations usually rearrange to more stable 2° or 3° carbocations.

- (1) A (2) B (3) C (4) D

Q.13 **Assertion :** Aryl halides undergo nucleophilic substitution with ease.

Reason : Carbon-halogen bond in aryl halides has partial double bond character.

(1) A (2) B (3) C (4) D

Q.14 **Assertion :** Optically active 2-iodobutane on treatment with NaI in acetone undergoes racemization.

Reason : Repeated Walden inversions on the reactant and its product eventually gives a racemic mixture.

(1) A (2) B (3) C (4) D

Q.15 **Assertion :** S_N2 reaction of an optically active alkyl halide with an aqueous solution of KOH always gives an alcohol with opposite sign of rotation.

Reason : S_N2 reactions always proceed with inversion of configuration.

(1) A (2) B (3) C (4) D

Q.16 **Assertion :** The dipole moment of CH_3F is greater than that of CH_3Cl

Reason : C-F bond is less polar than C-Cl bond.

(1) A (2) B (3) C (4) D

Q.17 **Assertion :** In SN^1 reaction inversion and retention both are take place .

Reason : In SN^1 reaction intermediate is carbocation

(1) A (2) B (3) C (4) D

Q.18 **Assertion :** S_N2 reaction takes place in single step.

Reason : S_N2 reaction involves the reactivity order of alkyl halides as $1^\circ > 2^\circ > 3^\circ$ halides.

(1) A (2) B (3) C (4) D

Q.19 **Assertion :** Ethyl chloride is more reactive than vinyl chloride towards nucleophile substitution reactions.

Reason : In vinyl chloride, the chlorine is bonded to sp^2 -hybridized carbon of an alkene.

(1) A (2) B (3) C (4) D

Q.20 **Assertion:** The presence of nitro group facilitates nucleophilic substitution reactions is aryl halides.

Reason: The intermediate carbanion is stabilized due to presence of nitro group. **[AIIMS-2006]**

(1) A (2) B (3) C (4) D

Prepared by Spark Chemistry

ANSWER KEY

EXERCISE # 1

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	2	4	4	1	3	2	4	2	3	2	3	2	1	4	2	2	1	2	3	3
Q.No.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	3	2	3	4	4	4	3	1	1	4	2	3	3	3	1	4	1	2	4	2
Q.No.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	2	1	1	2	1	4	3	2	1	2	4	4	1	1	1	2	4	4	2	2
Q.No.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Ans.	4	4	3	1	2	3	2	3	4	2	1	2	3	4	2	1	1	3	1	4
Q.No.	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Ans.	4	1	2	3	4	4	1	4	3	1	3	2	2	3	4	4	4	2	3	2

EXERCISE # 2

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	4	4	4	4	2	1	2	4	1	2	1	3	2	1	4	4	4	2	1	4
Q.No.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	
Ans.	3	1	3	1	1	1	3	2	1	4	1	1	1	1	3	2	3	2	4	

EXERCISE # 3A

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	1	1	2	1	2	2	2	4	2	1	2	3	1	3	3	3	2	2	1	1
Q.No.	21	22	23																	
Ans.	4	2	4																	

EXERCISE # 3B

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	2	2	4	1	1	3	4	1	3	2	3	4	2	4	1	2	1	2	3	3
Q.No.	21	22																		
Ans.	3	1																		

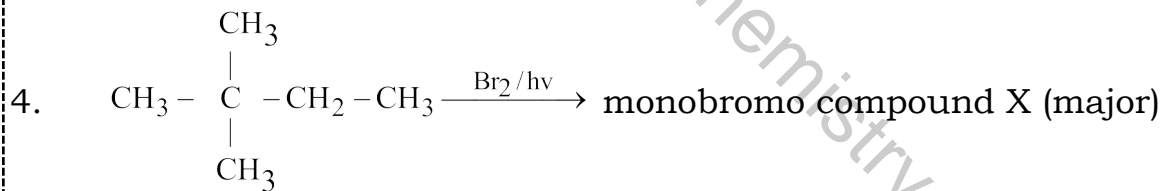
EXERCISE # 4

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	4	1	2	1	2	3	3	2	4	2	4	4	4	1	4	4	1	1	1	1

ALKYL, ARYL HALIDES

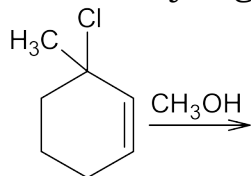
Integer answers type questions:

- When isopentane is subjected to monochlorination, what will be the number of monochlorinated products contain chiral carbon ?
- How many of the following statements are **true** ?
 - All halogens are soluble in CCl_4
 - Lower halogens displace upper halogens from the respective halates of the later
 - Upper halogens displace lower halogens from the respective halides of the later
 - All halogens form oxyacids
 - All halogens are coloured
 - Among oxides of halogens, monoxides are the strongest oxidants
 - All halogens form intra-halogen compounds
 - Inter halogen compounds are generally more reactive than halogens
 - All halogens can be stored in glass container except F_2 and HF
- A hydrocarbon (X) contains 91.2% carbon and 8.8% hydrogen. The compound on chlorination using $\text{Cl}_2/h\nu$ and $\text{Cl}_2/\text{AlCl}_3$ gives three isomeric monochloro substituted products. $\frac{\text{Total number of atoms present in (X)}}{5} = ?$

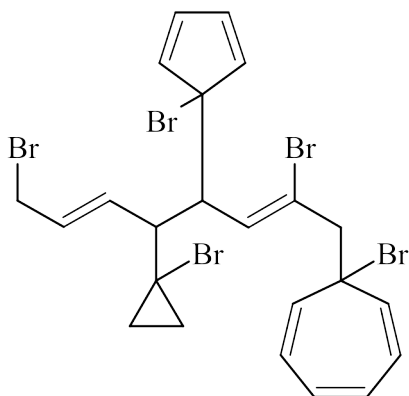


The number of possible stereoisomers, X can have

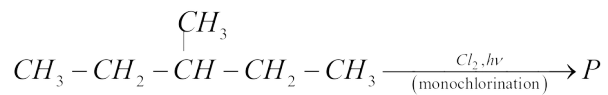
- How many isomers on monochlorination can be obtained from $(\text{CH}_3)_3\text{C}-\text{Et}$
- How many isomers are possible for the name bromomethylcyclopentane? (ignoring chirality)
- How many organic compounds are formed in the reaction ?



- How many moles of AgNO_3 will react with the given compound?



9.



Find the total number of isomeric products (P)

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ALKYL,ARYL HALIDES – KEY SHEET

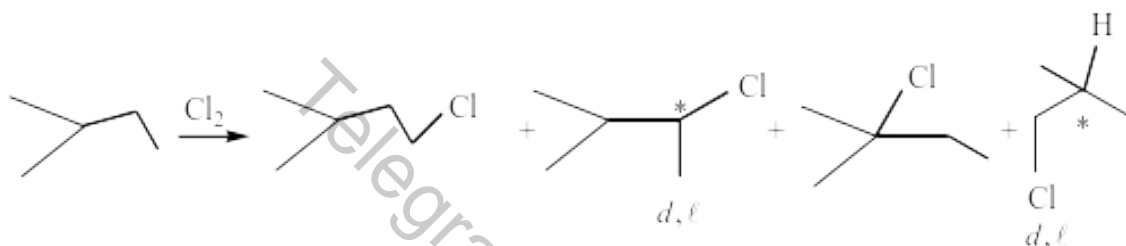
Integer Answers

1	4	2	7	3	3	4	2	5	4	6	6
7	4	8	3	9	8						

ALKYL,ARYL HALIDES – SOLUTIONS

Integer solutions

1.

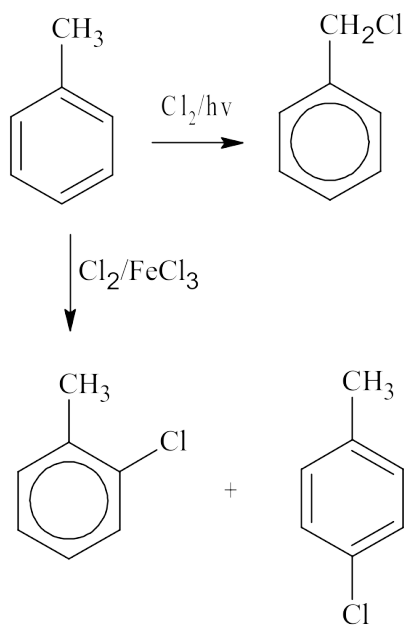


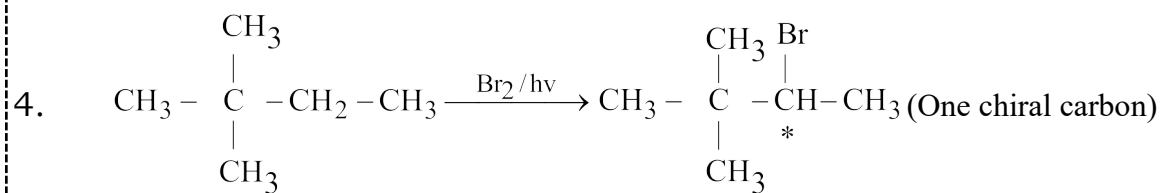
\therefore 4 products contain chiral carbon.

2. Statement ii, iii, v, vi, vii, viii and ix are correct. F_2 destroys CCl_4 and does not form any oxyacid.

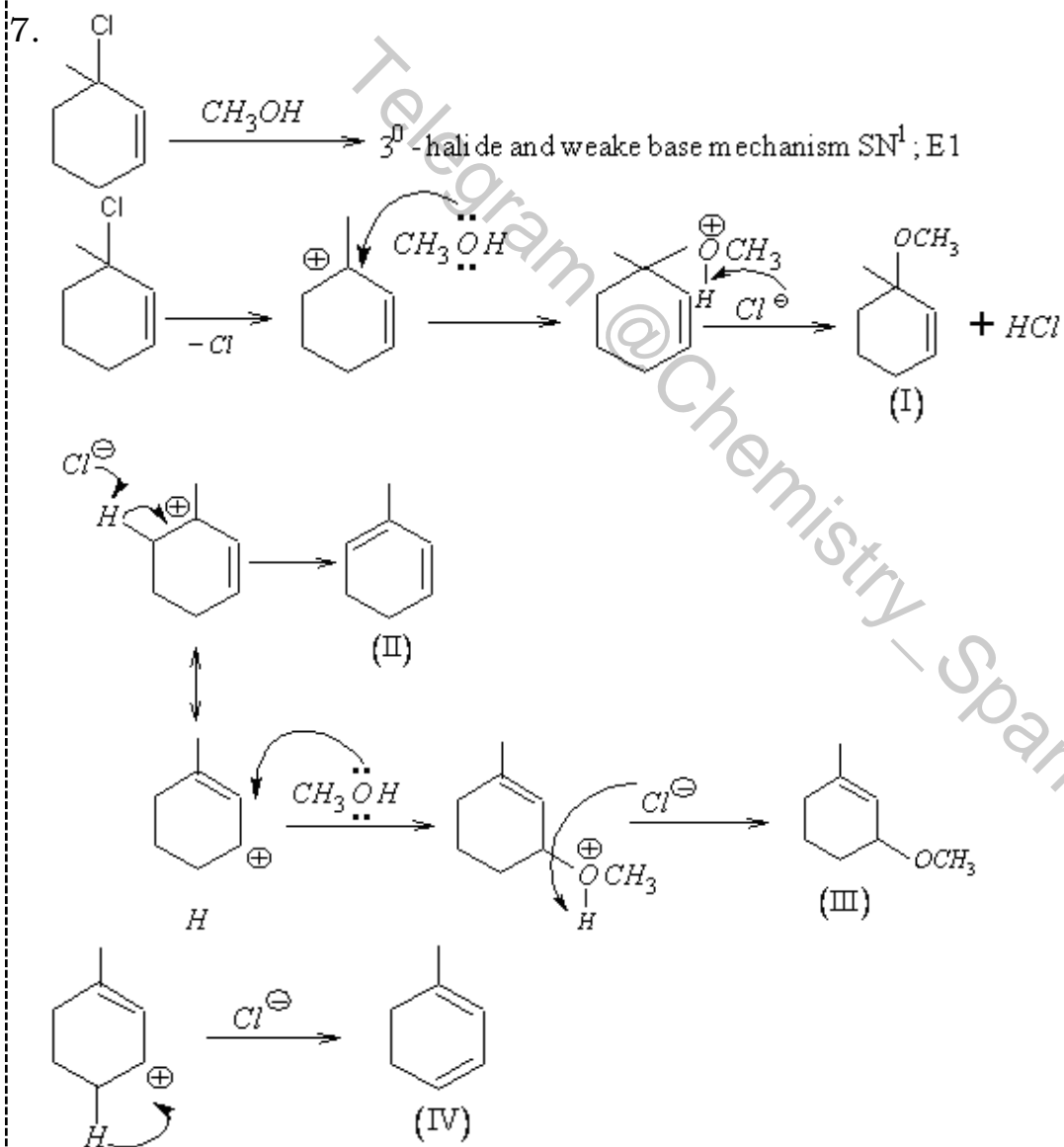
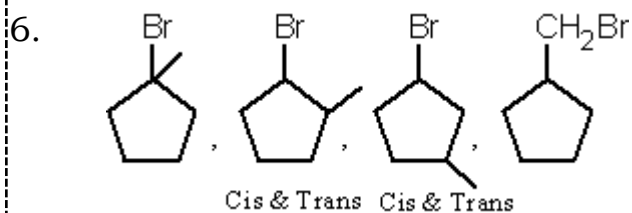
3.

x is





5. Fact



8. 3

9. 8

ALKYL, ARYL HALIDES

Matching answer type questions:

1. Match column-I and column-II with respect to rate determining step

Column I		Column II	
(a)		(p)	E^1
(b)		(q)	E^2
(c)		(r)	E^1CB
(d)		(s)	SN^1

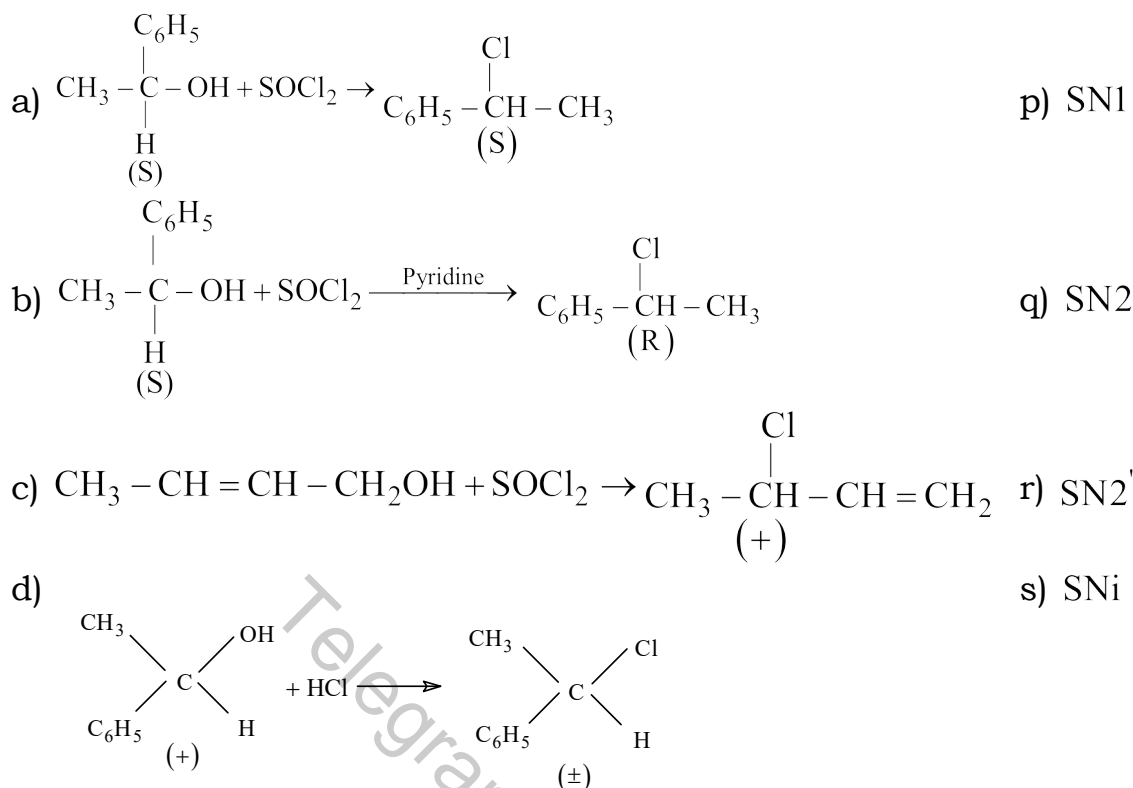
2. Match the following:

Column I		Column II	
(a)	$CH_3CHBrCD_3$ on treatment with alc.KOH gives $CH_2=CH-CD_3$ as a major product	(p)	E_1 reaction
(b)	$Ph-CHBr-CH_3$ reacts faster than $Ph-CHBr-CD_3$	(q)	E_2 reaction
(c)	$Ph-CH_2-CH_2Br$ on treatment with $C_2H_5OH / C_2H_5O^-$ gives $Ph-CH=CH_2$ as the major product	(r)	E_1cb reaction
(d)	$PhCH_2CH_2Br$ & $PhCD_2CH_2Br$ react with same rate	(s)	First order reaction

3.

List - I

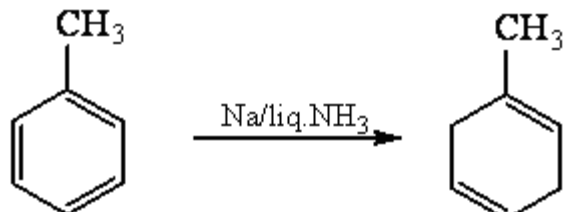
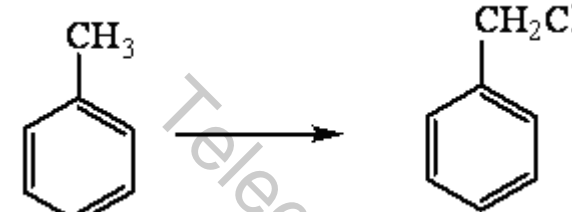
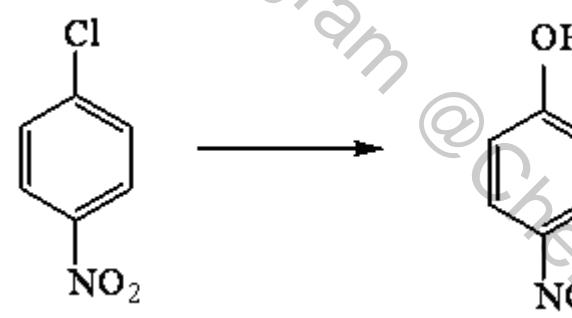
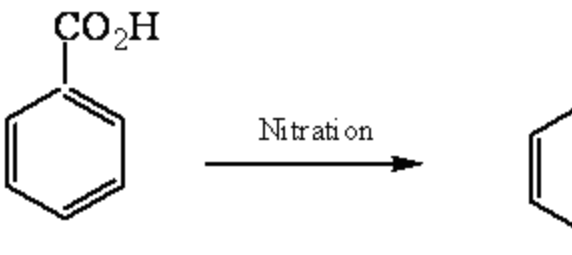
List - II



4.

Column I		Column II	
(a)	H_2S is weaker nucleophile than SH^-	(p)	Bulky group present on nucleophilic centre decreases nucleophilicity
(b)	CH_3^- is stronger nucleophile than NH_2^-	(q)	Nucleophilicity decreases on going from left to right in the period of periodic table.
(c)	R_3P is stronger nucleophile than R_3N	(r)	A species with a negative charge is a stronger nucleophile than a similar species without a negative charge
(d)	$\text{CH}_3 - \underset{\text{CH}_3}{\text{CH}} - \text{O}^{(-)}$ is weaker nucleophile than $\text{CH}_3 - \text{O}^{(-)}$	(s)	Nucleophilicity decreases on going down in the group of the periodic table

5. Column-1 contains some organic reactions and column-2 contains the nature of the intermediate through which the reaction goes. Match column-1 with column-2.

Column - I		Column - II	
(A)		(p)	Carbanion
(B)		(q)	Carbocation
(C)		(r)	Radical anion
(D)		(s)	Radical

6. Match the following

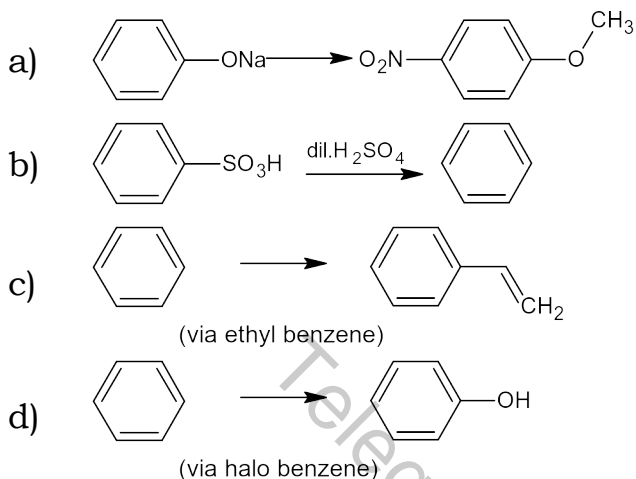
Reactions	Mechanism followed (major pathway only)
a) Potassium tertiary butoxide ion with 2-halo propane	p) S_N2
b) Potassium tertiary butoxide ion with methyl iodide	q) S_N1
c) Potassium hydroxide with ortho chloro nitro benzene	r) E_2

d) Solvolysis of tertiary butyl chloride

s) S_NAr

7. Match the following conversions in **Column-I** with types of reactions involved in the conversion in **Column-II**.

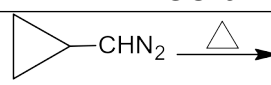

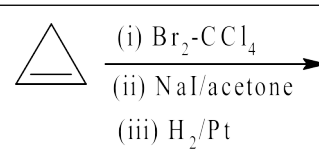
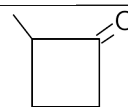


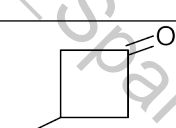
Column-I



Column-II

- p) EAS
- q) ArS_N
- r) Radical substitution
- s) Aliphatic S_N

8. Match the following

Column (I)	Column (II)
(A) 	(p) 
(B) 	(q) 
(C) 	(r) 
(D) $\text{Br}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{Br} \xrightarrow{\text{Mg, Dry Ether}}$	(s) 

9. Match the reaction mechanism in column I with their reaction conditions listed in column II. Indicate your answer by darkening the appropriate bubbles of the 4×4 matrix given in the ORS.

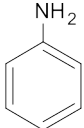
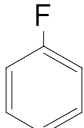
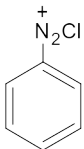
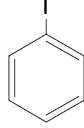

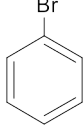
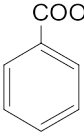

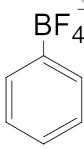
Column I	Column II
(A) S_N1	(p) 3° alkylhalide > 2° alkyl halides > 1° alkyl halides
(B) S_N2	(q) 1° alkyl halides > 2° alkyl halides > 3° alkyl halides
(C) E_1	(r) high concentration of strong base
(D) E_2	(s) polar protic solvent

10. Match the entries on the left with most appropriate choice (s) given on the right.

Column I (reaction)	Column II (product)
----------------------	---------------------

(A)	Dehalogenation of meso-2, 3-dibromobutane	(p)	S _N 2'
(B)	Dehalogenation of (S, S) - 2, 3-dibromobutane	(q)	Cis-2-butene
(C)	Hydrolysis of 2-bromo-3-methylbutane	(r)	S _N 1
(D)	$\text{CH}_3\text{CH}=\text{CHCH}_2\text{Cl} + \text{CN}^-$ $\rightarrow \text{CH}_3-\underset{\text{CN}}{\text{CH}}-\text{CH}=\text{CH}_2$	(s)	Trans-2-butene
		(t)	Anti-elimination

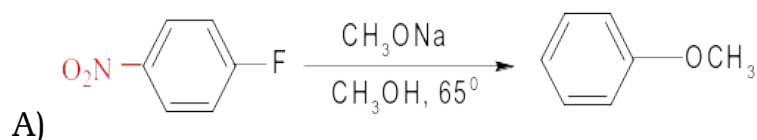
11. Match the column I with Column II

Column I		Column II	
(A)	 (i) NaNO ₂ /HCl (ii) CuBr/HBr	(p)	
(B)	 (i) HF/BF ₃ (ii) Δ	(q)	
(C)	 + Cl ₂ /Fe/Δ	(r)	
(D)	 (i) Moist Ag ₂ O (ii) Br ₂ /CCl ₄ /Δ	(s)	
		(t)	

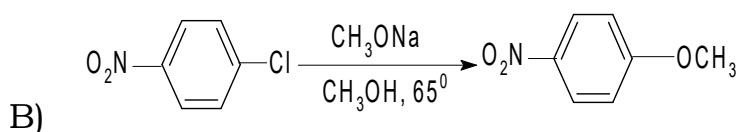
12. Match the following

Column - I

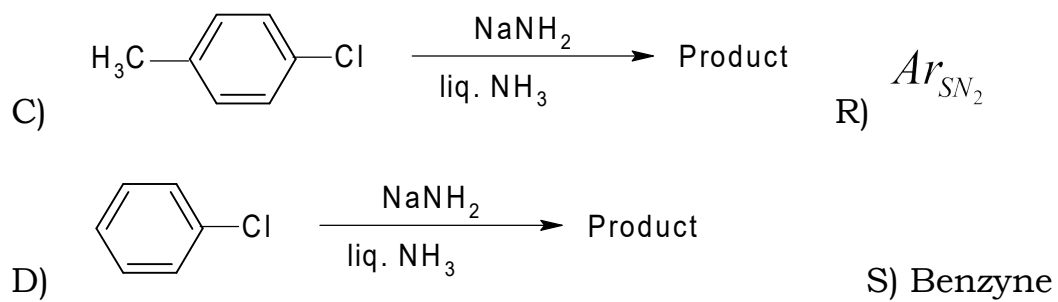
Column - II



P) Addition - Elimination



Q) Elimination - Addition



Telegram @Chemistry_Spark

ALKYL, ARYL HALIDES – KEY SHEET

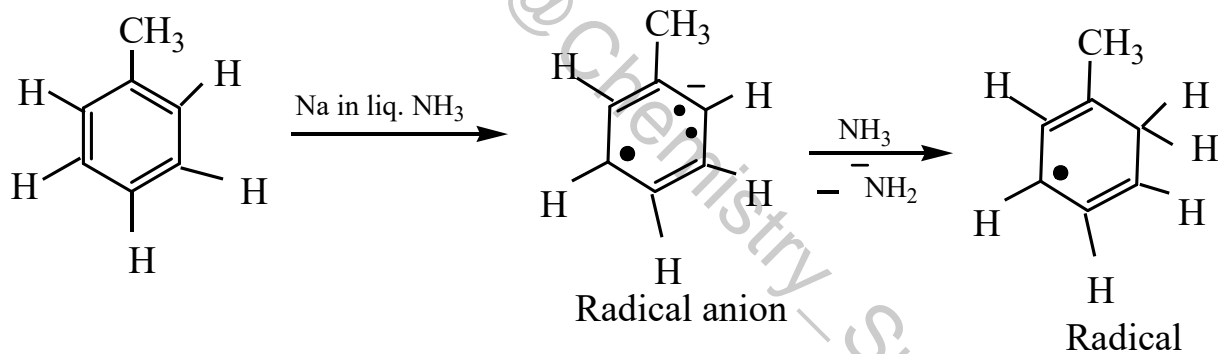
Matching Answers

1	A – PS B – R C – Q D – R	2	A – Q B – Q C – RS D – PS	3	A – S B – Q C – R D – P	4	A – R B – Q C – S D – P	5	A – PRS B – S C – P D – Q	6	A-R B-P C-S D-Q
7	A-PS B-P C-PR D-PQ	8	A-P B-R C-Q D-R	9	A-PS B-QR C-PS D-PR	10	A-ST B-QT C-R D-P	11	A-R B-P C-S D-R	12	A-PR B-PR C-QS D-QS

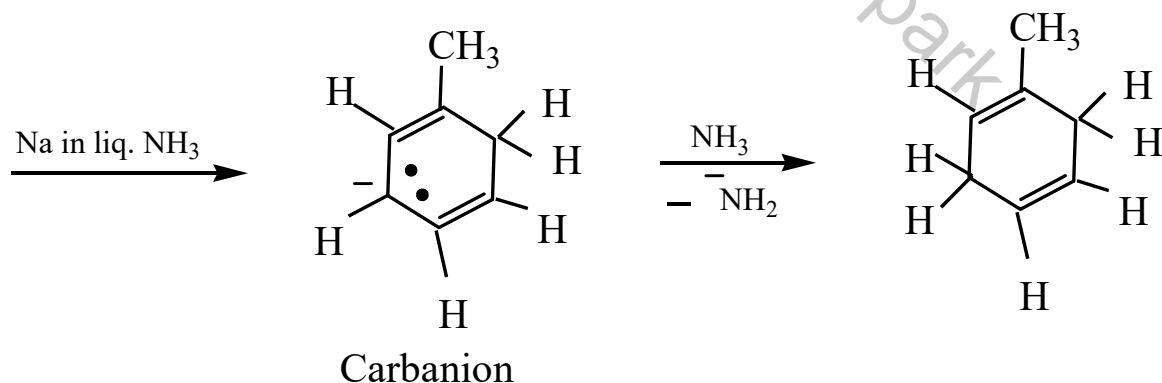
ALKYL, ARYL HALIDES – SOLUTIONS

Matching solutions

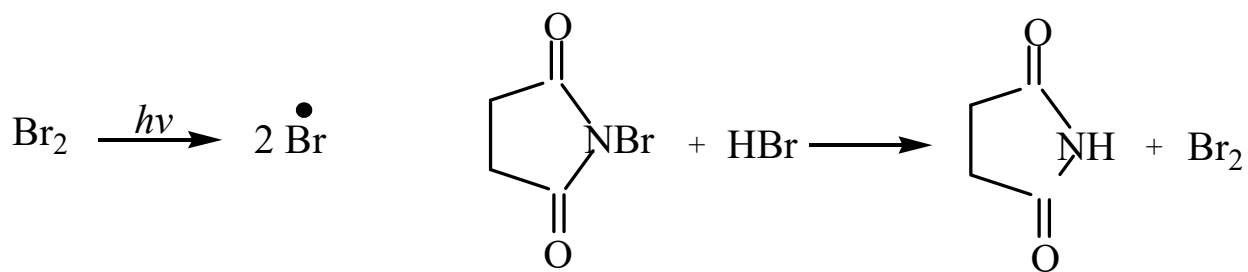
1. Conceptual
2. Conceptual
3. A) SN^1
4. Conceptual



5.



Soln



6. Conceptual

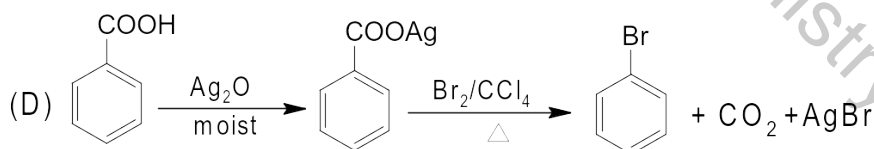
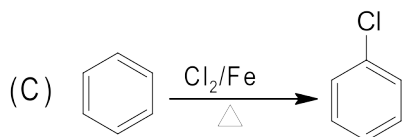
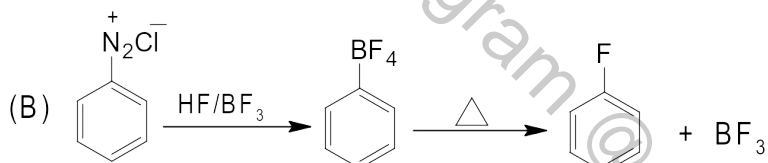
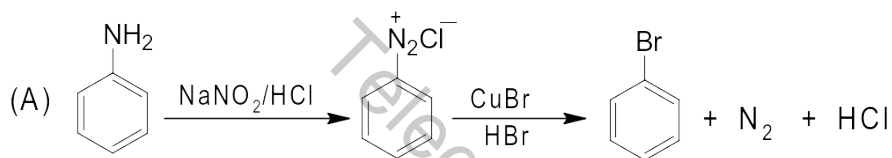
7. Conceptual

8. Conceptual

9. Conceptual

10. Conceptual

11. (A – R), (B – P), (C – S), (D – R)



12. Aromatic Nucleophilic substitution reaction

- Preparation of alkyl halides in laboratory is least preferred by
 - Halide exchange
 - Direct halogenation of alkanes
 - Treatment of alcohols
 - Addition of hydrogen halides to alkenes
- An alkyl halide may be converted into an alcohol by
[EAMCET 1980; CBSE PMT 1997; BHU 1999; AIIMS 2001]
 - Addition
 - Substitution
 - Dehydrohalogenation
 - Elimination
- The C – Cl bond in chlorobenzene as compared with C – Cl bond in methyl chloride is [MP PMT 1995]
 - Longer and weaker
 - Shorter and weaker
 - Shorter and stronger
 - Longer and stronger
- A salt solution is treated with chloroform drops. Then it is shaken with chlorine water. Chloroform layer becomes violet. Solution contains [CPMT 1982]
 - NO_2^- ion
 - NO_3^- ion
 - Br^- ion
 - I^- ion
- The following reaction belongs to

$$(\text{CH}_3)_3\text{C} - \text{Br} \xrightarrow{\text{H}_2\text{O}} (\text{CH}_3)_3\text{C} - \text{OH}$$
 [AIEEE 2002]
 - Elimination reaction
 - Substitution reaction
 - Free radical reaction
 - Displacement reaction
- The order of reactivities of methyl halides in the formation of Grignard reagent is [KCET 2003]
 - $\text{CH}_3\text{I} > \text{CH}_3\text{Br} > \text{CH}_3\text{Cl}$
 - $\text{CH}_3\text{Cl} > \text{CH}_3\text{Br} > \text{CH}_3\text{I}$
 - $\text{CH}_3\text{Br} > \text{CH}_3\text{Cl} > \text{CH}_3\text{I}$
 - $\text{CH}_3\text{Br} > \text{CH}_3\text{I} > \text{CH}_3\text{Cl}$
- Identify Z in the following series

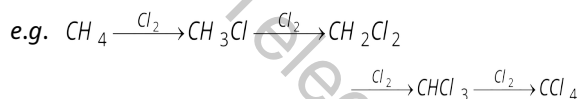
$$\text{C}_2\text{H}_5\text{I} \xrightarrow{\text{Alco. KOH}} \text{X} \xrightarrow{\text{Br}_2} \text{Y} \xrightarrow{\text{KCN}} \text{Z}$$
 [AIIMS 1983; AFMC 1998; MP PET 1997]
 - $\text{CH}_3\text{CH}_2\text{CN}$
 - $$\begin{array}{c} \text{CH}_2\text{CN} \\ | \\ \text{CH}_2\text{CN} \end{array}$$
 - $\text{BrCH}_2 - \text{CH}_2\text{CN}$
 - $\text{BrCH} = \text{CHCN}$
- The total number of stereoisomeric forms of $\text{C}_6\text{H}_6\text{Cl}_6$ known is
 - 6
 - 7
 - 8
 - None of these
- The correct order of C – X bond polarity is [RPMT 2000]
 - $\text{CH}_3\text{Br} > \text{CH}_3\text{Cl} > \text{CH}_3\text{I}$
 - $\text{CH}_3\text{I} > \text{CH}_3\text{Br} > \text{CH}_3\text{Cl}$
 - $\text{CH}_3\text{Cl} > \text{CH}_3\text{Br} > \text{CH}_3\text{I}$
 - $\text{CH}_3\text{Cl} > \text{CH}_3\text{I} > \text{CH}_3\text{Br}$
- The order of reactivities of the following alkyl halides for a S_N^2 reaction is [IIT-JEE (Screening) 2000]
 - $\text{RF} > \text{RCl} > \text{RBr} > \text{RI}$
 - $\text{RF} > \text{RBr} > \text{RCl} > \text{RI}$
 - $\text{RCl} > \text{RBr} > \text{RF} > \text{RI}$
 - $\text{RI} > \text{RBr} > \text{RCl} > \text{RF}$
- Which of the following reactions doesn't give benzene [RPMT 2003]
 - $\text{C}_6\text{H}_5\text{N}_2\text{Cl} \xrightarrow[\text{H}_2\text{O}]{\text{boiling}} \rightarrow$
 - $\text{C}_6\text{H}_5\text{N}_2\text{Cl} \xrightarrow[\Delta]{\text{C}_2\text{H}_5\text{OH}} \rightarrow$
 - $\text{C}_6\text{H}_5\text{N}_2\text{Cl} + \text{H}_3\text{PO}_2 + \text{H}_2\text{O} \longrightarrow$
 - All of these
- Benzene hexachloride is prepared from benzene and chlorine in sunlight by
 - Substitution reaction
 - Elimination reaction
 - Addition reaction
 - Rearrangement
- Carbon-halogen bond is strongest among the following [MP PMT 1995]
 - CH_3Cl
 - CH_3Br
 - CH_3F
 - CH_3I
- Which of these do not undergo Wurtz reaction

- (a) C_2H_5F (b) C_2H_5Br (c) 1-butyne (d) 2-butene
 (c) C_2H_5Cl (d) C_2H_5I 16. C_2H_5I and Ag_2O reacts to produce [Pb. PMT 2004]
 (a) C_2H_6 (b) $C_2H_5 - C_2H_5$
 (c) $C_2H_5 - O - C_2H_5$ (d) $C_2H_5 - CH_3$
15. When ethyl bromide reacts with sodium acetylide the main product is [Pb. CET 2002]
 (a) 1-butane (b) 1-butene

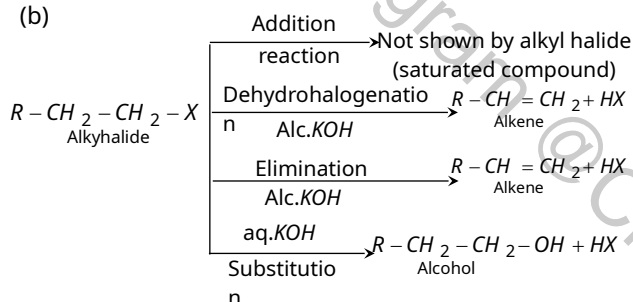
AS Answers and Solutions

(SET -25)

1. (b) Direct halogenation of alkenes is not preferred because in it a mixture of monohalogen, dihalogen, trihalogen and tetrahalogen substituted product is obtained which is difficult to separate.



2. (b)



3. (c) In chlorobenzene $C - Cl$ bond acquires partial double bond character because of resonance.
 4. (d) $2NaI + Cl_2 \rightarrow 2NaCl + I_2$ (Dissolves in $CHCl_3$ to give violet colour)

Chlorine displaces iodine from salt. The iodine get dissolve in $CHCl_3$ or CCl_4 to produce violet colour.

5. (b) $(CH_3)_3C - Br \xrightarrow{H_2O} (CH_3)_3C - OH$

Here Br substitute by $-OH$ group.

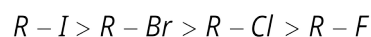
6. (a) Reactivity towards grignard reagent are as under
 $CH_3I > CH_3Br > CH_3Cl$

7. (b) $C_2H_5I \xrightarrow{alc.KOH} C_2H_4 \xrightarrow{Br_2} \begin{array}{c} CH_2-CH_2 \\ | \quad | \\ Br \quad Br \end{array}$
 $\xrightarrow{KCN} \begin{array}{c} CH_2-CH_2 \\ | \quad | \\ CN \quad CN \end{array}$
 Butene 1,4-dinitrile

8. (c) $C_6H_6Cl_6$ has 8 stereoisomer.

9. (c) The $C - X$ bond polarity order are as under
 $CH_3Cl > CH_3Br > CH_3I$

10. (d) The order of reactivity of alkyl halides for S_N^2 reaction is



11. (a) $C_6H_5N_2Cl \xrightarrow[H_2O]{Boiling} C_6H_5OH + N_2 + HCl$



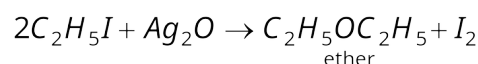
13. (c) $CH_3F > CH_3Cl > CH_3Br > CH_3I$

14. (a) $C_2H_5F + 2Na + FC_2H_5 \xrightarrow[ether]{Dry} \text{No reaction}$

15. (c) $C_2H_5Br + NaC \equiv CH \rightarrow C_2H_5C \equiv CH + NaBr$
 Ethyl bromide sodiumacetylide 1-butyne sodium bromide

Thus in this reaction 1-butyne is main product.

16. (c) C_2H_5I and Ag_2O reacts as below



Thus, $C_2H_5 - O - C_2H_5$ is produced.

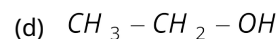
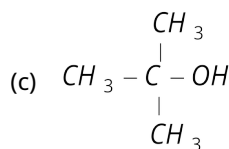
5. Chapter
Oxygen Containing Compounds
(Alcohol, Phenol, Ether, Carboxylic Acid,
Aldehyde & Ketone)

Ordinary Thinking

Objective Questions

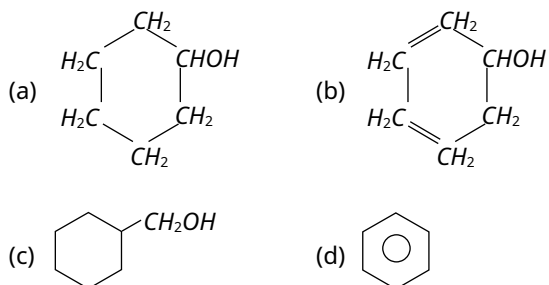
General introduction of alcohol, Phenol & Ethers

- Butane-2-ol is [CPMT 1977, 89]
 - Primary alcohol
 - Secondary alcohol
 - Tertiary alcohol
 - Aldehyde
- Picric acid is [CPMT 1971, 80, 81; DPMT 1983; MP PMT 1990; BHU 1996]
 - Trinitroaniline
 - Trinitrotoluene
 - A volatile liquid
 - 2, 4, 6 trinitrophenol
- 3-pentanol is a [RPET 2002]
 - Primary alcohol
 - Secondary alcohol
 - Tertiary alcohol
 - None of these
- Glycerol is a [DPMT 1984, 2000; MP PET 2001; J & K 2005]
 - Primary alcohol
 - Monohydric alcohol
 - Secondary alcohol
 - Trihydric alcohol
- Cresols are
 - Hydroxy toluenes
 - Dihydric phenols
 - Trihydric phenols
 - Trihydric alcohols
- Carbon percentage is maximum in [BHU 1998]
 - Pyrene
 - Gammexane
 - Ethylene glycol
 - PVC
- Ortho-dihydroxy benzene is
 - Carvacrol
 - Resorcinol
 - Catechol
 - Orcinol
- Glycerine has [MP PMT/PET 1988; MP PMT 1989, 91; AIIMS 1997]
 - One primary and two secondary $-OH$ groups
 - One secondary and two primary $-OH$ groups
 - Three primary $-OH$ groups
 - Three secondary $-OH$ groups
- Which of the following is tertiary alcohol [DPMT 2000]
 - $$\begin{array}{c} CH_2 - OH \\ | \\ CH - OH \\ | \\ CH_2 - OH \end{array}$$
 - $$\begin{array}{c} CH_2 \\ | \\ CH_3 - CH_2 - CH_2OH \\ | \\ CH_2 \\ | \\ CH_3 \end{array}$$



- Which is primary alcohol [CPMT 1980]
 - Butane-2-ol
 - Butane-1-ol
 - Propane-2-ol
 - Isopropyl alcohol
- Carbinol is [RPMT 2000]
 - C_2H_5OH
 - CH_3OH
 - $(CH_3)_2CHOH$
 - $CH_3CH_2CH(OH)CH_3$
- General formula of primary alcohol is [CPMT 1975]
 - $>CHOH$
 - $\geq C - OH$
 - $-CH_2OH$
 - $=C \begin{array}{l} \nearrow OH \\ \searrow OH \end{array}$
- Which of following is phenolic [J & K 2005]
 - Phthalic acid
 - Phosphoric acid
 - Picric acid
 - Phenylacetic acid
- 1, 2, 3-trihydroxybenzene is also known as
 - Pyrogallol
 - Phloroglucinol
 - Resorcinol
 - Quinol
- Butanal is an example of [MP PET 1991]
 - Primary alcohol
 - Secondary alcohol
 - Aliphatic aldehyde
 - Aliphatic ketone
- Cyclohexanol is a
 - Primary alcohol
 - Secondary alcohol
 - Tertiary alcohol
 - Phenol
- The characteristic grouping of secondary alcohols is [DPMT 1984]
 - $-CH_2OH$
 - $>CHOH$
 - $\begin{array}{c} | \\ -C - OH \\ | \end{array}$
 - $\begin{array}{c} OH \\ \nearrow \\ >C \\ \searrow \\ OH \end{array}$
- Which of the following are isomers [AFMC 2005; BCECE 2005]
 - Methyl alcohol and dimethyl ether
 - Ethyl alcohol and dimethyl ether
 - Acetone and acetaldehyde
 - Propionic acid and propanone
- The compound $HOCH_2 - CH_2OH$ is
 - Ethane glycol
 - Ethylene glycol
 - Ethylidene alcohol
 - Dimethyl alcohol

20. Methylated spirit is
 (a) Methanol (b) Methanol + ethanol
 (c) Methanoic acid (d) Methanamide
21. The structural formula of cyclohexanol is [Bihar CEE 1995]



22. Molecular formula of amyl alcohol is
 (a) $C_7H_{14}O$ (b) $C_6H_{13}O$
 (c) $C_5H_{12}O$ (d) $C_5H_{10}O$
23. Carboic acid is [MP PET/PMT 1998; RPET 1999; KCET (Engg./Med.) 1999; BHU 2000; MP PET 2003]
 (a) Phenol (b) Phenyl benzoate
 (c) Phenyl acetate (d) Salol
24. Absolute alcohol is [RPMT 1997]
 (a) 100% pure ethanol
 (b) 95% alcohol + 5% H_2O
 (c) Ethanol + water + phenol
 (d) 95% ethanol + 5% methanol
25. Which of the following is dihydric alcohol [DCE 2004]
 (a) Glycerol (b) Ethylene glycol
 (c) Catechol (d) Resorcinol
26. Wood spirit is known as [AFMC 2004]
 (a) Methanol (b) Ethanol
 (c) Acetone (d) Benzene
27. Oxygen atom in ether is [MP PMT/PET 1988]
 (a) Very active (b) Replaceable
 (c) Comparatively inert (d) Active
28. Which of the following is a simple ether [AFMC 1997]
 (a) CH_3OCH_3 (b) $C_2H_5OCH_3$
 (c) $C_6H_5OCH_3$ (d) $C_6H_5OC_2H_5$
29. An example of a compound with the functional group ' $-O-$ ' is [CPMT 1983]
 (a) Acetic acid (b) Methyl alcohol
 (c) Diethyl ether (d) Acetone
30. Which of the following do not contain an acyl group
 (a) Acid chloride (b) Amide
 (c) Ester (d) Ether
31. Name of $(CH_3)_2HC - O - CH_2 - CH_2 - CH_3$ is [MP PMT 1992]

- (a) Isopropyl propyl ether (b) Dipropyl ether
 (c) Di-isopropyl ether (d) Isopropyl propyl ketone
32. Acetals are [BVP 2003]
 (a) Ketones (b) Diethers
 (c) Aldehyde (d) Hydroxy aldehydes
33. In ethers, the $C - O - C$ bond angle is
 (a) 180° (b) 90°
 (c) 110° (d) 160°
34. According to Lewis concept of acids and bases, ether is [CPMT 1994]
 (a) Acidic (b) Basic
 (c) Neutral (d) Amphoteric
35. The compound which is not isomeric with diethyl ether is [IIT 1981; CPMT 1989; Bihar MEE 1995; MP PET 2001]
 (a) *n*-propylmethyl ether (b) Butan-1-ol
 (c) 2-methylpropan-2-ol (d) Butanone
36. Structure of diethyl ether is confirmed by [DPMT 1985]
 (a) Kolbe's synthesis (b) Frankland's synthesis
 (c) Wurtz's synthesis (d) Williamson's synthesis
37. Fermentation is an [CPMT 1977; RPMT 1999]
 (a) Endothermic reaction (b) Exothermic reaction
 (c) Reversible reaction (d) None of these
38. Nitroglycerine is
 (a) An ester (b) An alcohol
 (c) A nitro compound (d) An acid
39. Which of the following are known as mercaptans [Pb. PMT 2002]
 (a) Thio-alcohols (b) Thio-ethers
 (c) Thio-acids (d) Thio-aldehydes

Preparation of alcohol, Phenol and Ethers

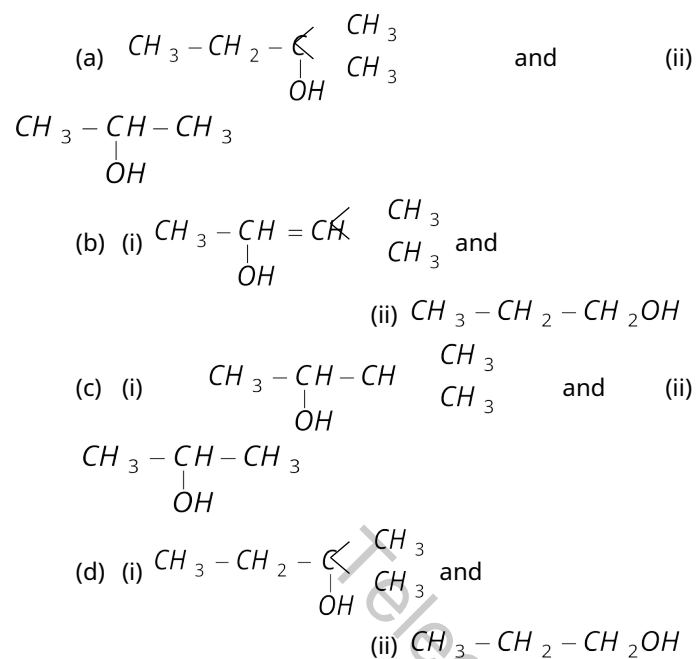
1. Ethanol is prepared industrially by [MP PMT 1989]
 (a) Hydration of ethylene (b) Fermentation of sugars
 (c) Both the above (d) None of these
2. Ethyl alcohol is industrially prepared from ethylene by [CPMT 1985]
 (a) Permanganate oxidation
 (b) Catalytic reduction
 (c) Absorbing in H_2SO_4 followed by hydrolysis
 (d) Fermentation
3. Propene, $CH_3 - CH = CH_2$ can be converted to 1-propanol by oxidation. Which set of reagents among the following is ideal to effect the conversion [CBSE PMT 1991]

- (a) Alkaline $KMnO_4$
 (b) B_2H_6 and alkaline H_2O_2
 (c) O_3 / Zn dust
 (d) $OsO_4 / CH_4, Cl_2$
4. Which one of the following will produce a primary alcohol by reacting with CH_3MgI [MP PET 1991]
 (a) Acetone (b) Methyl cyanide
 (c) Ethylene oxide (d) Ethyl acetate
5. The fermentation of starch to give alcohol occurs mainly with the help of [CPMT 1971; MH CET 1999; RPMT 2000]
 (a) O_2 (b) Air
 (c) CO_2 (d) Enzymes
6. Coconut oil upon alkaline hydrolysis gives [MP PET 1991; AFMC 2000; KCET 2001; BCECE 2005]
 (a) Glycol (b) Alcohol
 (c) Glycerol (d) Ethylene oxide
7. Which enzyme converts glucose and fructose both into ethanol [MP PMT 1989, 90, 96; CPMT 1983, 84, 86, 94; KCET 1989; MNR 1978; MP PET 1994, 99]
 (a) Diastase (b) Invertase
 (c) Zymase (d) Maltase
8. Chlorination of toluene in the presence of light and heat followed by treatment with aqueous $NaOH$ gives [IIT-JEE 1990]
 (a) *o*-cresol (b) *p*-cresol
 (c) 2, 4-dihydroxy toluene (d) Benzyl alcohol
9. In the commercial manufacture of ethyl alcohol from starchy substances by fermentation method, which enzymes stepwise complete the fermentation reaction [BIT 1992]
 (a) Diastase, maltase and zymase
 (b) Maltase, zymase and invertase
 (c) Diastase, zymase and lactase
 (d) Diastase, invertase and zymase
10. Primary alcohols can be obtained from the reaction of the $RMgX$ with [Pb. PMT 2001]
 (a) CO_2 (b) $HCHO$
 (c) CH_3CHO (d) H_2O
11. On heating aqueous solution of benzene diazonium chloride, which is formed [CPMT 1988; BHU 1980]
 (a) Benzene (b) Chlorobenzene
 (c) Phenol (d) Aniline
12. $LiAlH_4$ converts acetic acid into [CPMT 1977; MP PMT 1990, 92]
 (a) Acetaldehyde (b) Methane
 (c) Ethyl alcohol (d) Methyl alcohol
13. Formaldehyde gives an additive product with methyl magnesium iodide which on aqueous hydrolysis gives [MP PMT/PET 1988]
 (a) Isopropyl alcohol (b) Ethyl alcohol
 (c) Methyl alcohol (d) Propyl alcohol
14. Benzyl alcohol is obtained from benzaldehyde by [CPMT 1983; MNR 1993]
 (a) Fittig's reaction (b) Cannizzaro's reaction
 (c) Kolbe's reaction (d) Wurtz's reaction
15. Benzene diazonium chloride on boiling with dilute sulphuric acid gives [MP PMT 1983]
 (a) Toluene (b) Benzoic acid
 (c) Benzene (d) Phenol
16. The reaction given below is known as
 $C_2H_5ONa + IC_2H_5 \longrightarrow C_2H_5OC_2H_5 + NaI$
 [CPMT 1990; KCET 1990; MH CET 2003; Pb. CET 2002]
 (a) Kolbe's synthesis (b) Wurtz's synthesis
 (c) Williamson's synthesis (d) Grignard's synthesis
17. Salicylaldehyde can be prepared from [CPMT 1983]
 (a) Phenol and chloroform
 (b) Phenol, chloroform and sodium hydroxide
 (c) Phenol, carbon tetrachloride and $NaOH$
 (d) None of these
18. If formaldehyde and potassium hydroxide are heated, then we get [CPMT 1989, 90; KCET 2000]
 (a) Acetylene (b) Methane
 (c) Methyl alcohol (d) Ethyl formate
19. An organic compound dissolved in dry benzene evolved hydrogen on treatment with sodium. It is [NCERT 1981; SCRA 1990]
 (a) A ketone (b) An aldehyde
 (c) A tertiary amine (d) An alcohol
20. $A \xrightarrow[\text{dil. } H_2SO_4]{K_2Cr_2O_7} B \xrightarrow[H_2O]{CH_3MgI} CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{OH}{|}}{C}} - CH_3$. The reactant A is [MH CET 2002, 03; AFMC 2004; MP PMT/PET 1988; EAMCET 1989; CPMT 1988; MP PET 2000]
 (a) $CH_3CHOHCH_3$ (b) CH_3COCH_3
 (c) C_2H_5OH (d) CH_3COOH
21. The reaction, water gas ($CO + H_2$) + H_2 673K, 300 atmosphere in presence of the catalyst Cr_2O_3 / ZnO is used for the manufacture of [MP PMT 1989]
 (a) $HCHO$ (b) $HCOOH$
 (c) CH_3OH (d) CH_3COOH
22. $CH_2 = CH_2 + B_2H_6 \xrightarrow[H_2SO_4]{NaOH}$ Product. Product in above reaction is [RPMT 2003]
 (a) CH_3CH_2CHO (b) CH_3CH_2OH
 (c) CH_3CHO (d) None of these

23. Phenolphthalein is obtained by heating phthalic anhydride with conc. H_2SO_4 and [BHU 1996]
 (a) Benzyl alcohol (b) Benzene
 (c) Phenol (d) Benzoic acid
24. Maltose on hydrolysis gives [BHU 1996; CPMT 2001]
 (a) Mannose + glucose (b) Galactose + glucose
 (c) Glucose (d) Mannose + fructose
25. Absolute alcohol can be obtained from rectified spirit [KCET 1985]
 (a) By removing the water in it using concentrated sulphuric acid
 (b) By removing the water using phosphorus pentoxide
 (c) By distilling with the appropriate amount of benzene
 (d) By distilling over plenty of quick lime
26. Grignard reagent reacts with compounds containing which of the following groups [MNR 1987]
 (a) $>C=O$ (b) $-C \equiv N$
 (c) $>C=S$ (d) All of these
27. $Oil + NaOH_{(aq)} \xrightarrow{\Delta} \text{Glycerol} + \text{Soap}$
 Above reaction is called [UPSEAT 2001]
 (a) Saponification (b) Esterification
 (c) Hydrogenation (d) None of these
28. Acetone on treatment with CH_3-Mg-I and on further hydrolysis gives [UPSEAT 2000]
 (a) Isopropyl alcohol (b) Primary alcohol
 (c) Acetic acid (d) 2-methyl 2-propanol
29. In the following reaction 'A' is

$$C_2H_5MgBr + H_2C \begin{array}{c} \diagup \\ O \\ \diagdown \end{array} CH_2 \xrightarrow{H_2O} A$$

 [MP PET 1994; CBSE PMT 1998]
 (a) $C_2H_5CH_2CHO$ (b) $C_2H_5CH_2CH_2OH$
 (c) $C_2H_5CH_2OH$ (d) C_2H_5CHO
30. Sodium benzene sulphonate reacts with $NaOH$ and then on acidic hydrolysis, it gives [Roorkee 1995; KCET 1998]
 (a) Phenol (b) Benzoic acid
 (c) Benzene (d) Disodium benzaldehyde
31. Phenol is obtained by heating aqueous solution of [MP PMT 1995]
 (a) Aniline
 (b) Benzene diazonium chloride
 (c) Benzoic acid
 (d) None of these
32. C_2H_5MgI reacts with $HCHO$ to form last product [MP PMT 1991]
 (a) CH_3CHO (b) C_3H_7OH
 (c) CH_3COCH_3 (d) CH_3COOCH_3
33. Which one is not synthesized by Grignard reagent [MP PET 1991]
 (a) Primary alcohol (b) Secondary alcohol
 (c) A ketone (d) An ester
34. Reaction of aqueous sodium hydroxide on (i) ethyl bromide and (ii) chlorobenzene gives
 (a) (i) Ethene and (ii) o-chlorophenol
 (b) (i) Ethyl alcohol and (ii) o-chlorophenol
 (c) (i) Ethyl alcohol and (ii) phenol
 (d) (i) Ethyl alcohol and (ii) no reaction
35. $RMgBr$ on reaction with an excess of oxygen followed by hydrolysis gives [Roorkee Qualifying 1998]
 (a) RH (b) $ROOR$
 (c) $ROOH$ (d) ROH
36. The reaction between an ester and excess of Grignard reagent shall finally result in a [UPSEAT 2000]
 (a) Primary alcohol (b) Secondary alcohol
 (c) Tertiary alcohol (d) Ketone
37. The compound that will react most readily with $NaOH$ to form methanol is [IIT-JEE (Screening) 2001]
 (a) $(CH_3)_4N^+I^-$ (b) CH_3OCH_3
 (c) $(CH_3)_3S^+I^-$ (d) $(CH_3)_3Cl$
38. When 2-ethylantraquinol dissolved in a mixture of benzene and cyclohexanol is oxidised, the product is [IPMER 1999]
 (a) Ethanol (b) Hydrogen peroxide
 (c) Anthracene (d) None of these
39. Which gas is eliminated in fermentation [RPMT 1997]
 (a) O_2 (b) CO_2
 (c) N_2 (d) H_2
40. Action of nitrous acid with ethylamine produces [BHU 2000]
 (a) Ethane (b) Ammonia
 (c) Ethyl alcohol (d) Nitroethane
41. The product of reduction of benzaldehyde is
 (a) Benzoic acid (b) Benzyl alcohol
 (c) Benzene (d) Catechol
42. Commercially methanol is prepared by [IIT 1984; MP PMT 1990; KCET 1992]
 (a) Reduction of CO in presence of $ZnO.Cr_2O_3$
 (b) Methane reacts with water vapours at $900^\circ C$ in presence of Ni catalyst
 (c) Reduction of $HCHO$ by $LiAlH_4$
 (d) Reduction of $HCHO$ by aqueous $NaOH$
43. Action of water in the presence of sulphuric acid with the following alkenes
 (i) $CH_3-CH=CH_2$ and $CH_3-CH=CH-CH_3$
 (ii) $CH_3-CH=CH_2$ gives



44. From Williamson's synthesis preparation of which of following is possible

(a) Only symmetrical ethers (b) Only symmetrical ethers
(c) Both types (d) None of these

45. In the reaction $\text{Ar} - \text{OH} + \text{RX} \xrightarrow{\text{alkali}} \text{A}$, A is
[MP PET 1994]

(a) An aldehyde (b) An aryl chloride
(c) An ether (d) A ketone

46. Williamson's synthesis is used to prepare
[DPMT 1976, 81, 82, 83, 84; CPMT 1976, 82]

(a) Acetone (b) Diethyl ether
(c) P.V.C. (d) Bakelite

47. When an alkyl halide is allowed to react with a sodium alkoxide the product most likely is
[MP PMT 1996; EAMCET 1998]

(a) An aldehyde (b) A ketone
(c) An ether (d) A carboxylic acid

48. In Williamson's synthesis, ethoxyethane is prepared by
[MP PMT 1995; BHU 2005]

(a) Passing ethanol over heated alumina
(b) Sodium ethoxide with ethyl bromide
(c) Ethyl alcohol with sulphuric acid
(d) Ethyl iodide and dry silver oxide

49. Formation of diethyl ether from ethanol is based on a
[BVP 2003]

(a) Dehydration reaction
(b) Dehydrogenation reaction
(c) Hydrogenation reaction
(d) Heterolytic fission reaction

50. The compound formed when ethyl bromide is heated with dry silver oxide is
[MP PET/PMT 1988]

(a) Dimethyl ether (b) Diethyl ether
(c) Methyl alcohol (d) Ethyl alcohol

51. The reagent used for the preparation of higher ether from halogenated ethers is
[Tamil Nadu CET 2001]

(a) conc. H_2SO_4 (b) Sodium alkoxide
(c) Dry silver oxide (d) Grignard reagent

52. Acetyl bromide reacts with excess of CH_3MgI followed by treatment with a saturated solution of NH_4Cl gives
[AIEEE 2004]

(a) 2-methyl-2-propanol (b) Acetamide
(c) Acetone (d) Acetyl iodide

53. What is obtained when chlorine is passed in boiling toluene and product is hydrolysed
[DCE 2004]

(a) o-Cresol (b) p-Cresol
(c) 2, 4-Dihydroxytoluene (d) Benzyl alcohol

54. Which of the following is formed when benzaldehyde reacts with sodium hydroxide
[Pb. CET 2002]

(a) Benzyl alcohol (b) Benzoic acid
(c) Glucose (d) Acetic acid

55. When ethanal reacts with CH_3MgBr and $\text{C}_2\text{H}_5\text{OH}$ / dry HCl the product formed are
[DCE 2003]

(a) Ethyl alcohol and 2-propanol
(b) Ethane and hemi-acetal
(c) 2-propanol and acetal
(d) Propane and methyl acetate

56. Which of the following is industrially prepared by passing ethylene into hypochlorous acid
[BHU 2004]

(a) Ethylene glycol (b) Ethylene oxide
(c) Ethylene dinitrate (d) Ethane

57. In which case methyl-t-butyl ether is formed
[Orissa JEE 2004]

(a) $(\text{C}_2\text{H}_5)_3\text{CONa} + \text{CH}_3\text{Cl}$
(b) $(\text{CH}_3)_3\text{CONa} + \text{CH}_3\text{Cl}$
(c) $(\text{CH}_3)_3\text{CONa} + \text{C}_2\text{H}_5\text{Cl}$
(d) $(\text{CH}_3)_3\text{CONa} + \text{CH}_3\text{Cl}$

58. Which of the following combinations can be used to synthesize ethanol
[KCET 2004]

(a) CH_3MgI and CH_3COCH_3
(b) CH_3MgI and $\text{C}_2\text{H}_5\text{OH}$
(c) CH_3MgI and $\text{CH}_3\text{COOC}_2\text{H}_5$
(d) CH_3MgI and HCOOC_2H_5

59.

$C_6H_5-CH=CHCHO \xrightarrow{X} C_6H_5CH=CHCH_2OH$. In the above sequence X can be [DCE 2004]

- (a) H_2/Ni (b) $NaBH_4$
(c) $K_2Cr_2O_7/H^+$ (d) Both (a) and (b)

60. Alkenes convert into alcohols by [MP PET 1991]

- (a) Hydrolysis by dil. H_2SO_4
(b) Hydration of alkene by alkaline $KMnO_4$
(c) Hydrolysis by water vapours and conc. H_2SO_4
(d) Hydration of alkene by aqueous KOH

61. Acetic acid and CH_3OH are obtained on large scale by destructive distillation of

- (a) Wood (b) Coal
(c) Turpentine (d) Crude oil

62. Which is formed when benzaldehyde react with nitrous acid [KCET (Med.) 2001]

- (a) C_6H_5OH (b) C_6H_5ON
(c) $C_2H_5N_2OH$ (d) $C_6H_5CH_2OH$

63. Acid catalyzed hydration of alkenes except ethene leads to the formation of [AIEEE 2005]

- (a) Primary alcohol
(b) Secondary or tertiary alcohol
(c) Mixture of primary and secondary alcohols
(d) Mixture of secondary and tertiary alcohols

64. Methylphenyl ether can be obtained by reacting [J & K 2005]

- (a) Phenolate ions and methyl iodide
(b) Methoxide ions and bromobenzene
(c) Methanol and phenol
(d) Bromo benzene and methyl bromide

Properties of alcohol, Phenol and Ethers

1. Which compound is formed when CH_3OH reacts with CH_3-Mg-X [CPMT 1977, 89]

- (a) Acetone (b) Alcohol
(c) Methane (d) Ethane

2. A compound X of formula C_3H_8O yields a compound C_3H_6O , on oxidation. To which of the following classes of compounds could X being [Pb. PMT 2000]

- (a) Secondary alcohol (b) Alkene

(c) Aldehyde (d) Tertiary alcohol

3. The boiling point of alcohol are than corresponding thiols [Pb. PMT 2000]

- (a) More (b) Same
(c) Either of these (d) Less

4. Methyl alcohol can be distinguished from ethyl alcohol using [KCET 1984; BHU 2000]

- (a) Fehling solution
(b) Schiff's reagent
(c) Sodium hydroxide and iodine
(d) Phthalein fusion test

5. A compound X with molecular formula C_3H_8O can be oxidised to a compound Y with the molecular formula $C_3H_6O_2$. X is most likely to be [MP PMT 1991]

- (a) Primary alcohol (b) Secondary alcohol
(c) Aldehyde (d) Ketone

6. An alcohol on oxidation is found to give CH_3COOH and CH_3CH_2COOH . The structure of the alcohol is [BIT 1990]

- (a) $CH_3CH_2CH_2OH$
(b) $(CH_3)_2C(OH)CH_2CH_3$
(c) $CH_3CH_2CHOHCH_3$
(d) $CH_3CH(OH)CH_2CH_2CH_3$

7. An organic liquid A containing C, H and O has a pleasant odour with a boiling point of $78^\circ C$. On boiling A with conc. H_2SO_4 a colourless gas is produced which decolourises bromine water and alkaline $KMnO_4$. One mole of this gas also takes one mole of H_2 . The organic liquid A is [KCET 1993]

- (a) C_2H_5Cl (b) C_2H_5CHO
(c) C_2H_6 (d) C_2H_5OH

8. An aromatic amine (A) was treated with alcoholic potash and another compound (Y) when foul smelling gas was formed with formula C_6H_5NC . Y was formed by reacting a compound (Z) with Cl_2 in the presence of slaked lime. The compound (Z) is [CBSE PMT 1990]

- (a) $C_6H_5NH_2$ (b) C_2H_5OH
(c) CH_3OCH_3 (d) $CHCl_3$

9. Rectified spirit obtained by fermentation contains 4.5% of water. So in order to remove it, rectified spirit

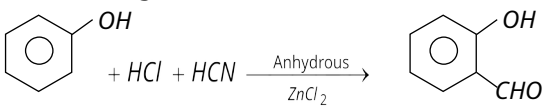
- is mixed with suitable quantity of benzene and heated. Benzene helps because [KCET 1987]
- It is dehydrating agent and so removes water
 - It forms the lower layer which retains all the water so that alcohol can be distilled off
 - It forms an azeotropic mixture having high boiling point and thus allows the alcohol to distill over
 - It forms low boiling azeotropic mixtures which distill over, leaving behind pure alcohol which can then be distilled
10. $C_6H_5OH + ClCOCH_3 \xrightarrow{aq. NaOH} C_6H_5OCOCH_3$ is an example of [BHU 1984]
- Dow's reaction
 - Reimer-Tiemann reaction
 - Schotten-Baumann reaction
 - Kolbe's reaction
11. Ortho-nitrophenol is steam volatile whereas para-nitrophenol is not. This is due to [CBSE PMT 1989]
- Intramolecular hydrogen bonding present in ortho-nitrophenol
 - Intermolecular hydrogen bonding
 - Intramolecular hydrogen bonding present in para-nitrophenol
 - None of these
12. Reaction of phenol with dil. HNO_3 gives [KCET 1993; RPMT 1997]
- p* and *m*-nitrophenols
 - o*- and *p*-nitrophenols
 - Picric acid
 - o*- and *m*-nitrophenols
13. Phenol is less acidic than [IIT-JEE 1986; UPSEAT 2003; Orissa JEE 2004]
- Acetic acid
 - p*-nitrophenol
 - Both (a) and (b)
 - None of these
14. The strongest acid among the following aromatic compounds is [NCERT 1978]
- ortho-nitrophenol
 - para-chlorophenol
 - para-nitrophenol
 - meta-nitrophenol
15. Diazo-coupling is useful to prepare some [CBSE PMT 1994]
- Pesticides
 - Proteins
 - Dyes
 - Vitamins
16. Glycerol reacts with $P_4 + I_2$ to form [CBSE PMT 1991]
- Aldehyde
 - Allyl iodide
 - Allyl alcohol
 - Acetylene
17. When glycerine is added to a litre of water which of the following behaviour is observed [NCERT 1977; BHU 1979]
- Water evaporates more easily
 - The temperature of water is increased
 - The freezing point of water is lowered
 - The viscosity of water is lowered
18. Final product formed on reduction of glycerol by hydroiodic acid is [CPMT 1987]
- Propane
 - Propanoic acid
 - Propene
 - Propyne
19. Glycerol was distilled with oxalic acid crystals and the products were led into Fehling solution and warmed. Cuprous oxide was precipitated. It is due to [KCET 1987]
- CO
 - HCHO
 - CH_3CHO
 - HCOOH
20. Kolbe-Schmidt reaction is used for [CBSE PMT 1991]
- Salicylic acid
 - Salicylaldehyde
 - Phenol
 - Hydrocarbon
21. Which of the following explains the viscous nature of glycerol [JIPMER 1997]
- Covalent bonds
 - Hydrogen bonds
 - Vander Wall's forces
 - Ionic forces
22. On heating glycerol with conc. H_2SO_4 , a compound is obtained which has a bad odour. The compound is [CPMT 1974; CBSE PMT 1994]
- Glycerol sulphate
 - Acrolein
 - Formic acid
 - Allyl alcohol
23. Isopropyl alcohol on oxidation forms [CPMT 1971, 81, 94; RPMT 2002]
- Acetone
 - Ether
 - Ethylene
 - Acetaldehyde
24. Benzenediazonium chloride on reaction with phenol in weakly basic medium gives [IIT-JEE 1998]
- Diphenyl ether
 - p*-hydroxyazobenzene
 - Chlorobenzene
 - Benzene
25. The alcohol that produces turbidity immediately with $ZnCl_2 +$ conc. HCl at room temperature [EAMCET 1997; MP PMT 1989, 99; IIT JEE 1981, 86; CBSE PMT 1989; CPMT 1989; MP PET 1997; JIPMER 1999]
- 1-hydroxybutane
 - 2-hydroxybutane
 - 2-hydroxy-2-methylpropane
 - 1-hydroxy-2-methylpropane
26. The reagent which easily reacts with ethanol and propanol is [MP PET 1989]
- Fehling solution
 - Grignard reagent
 - Schiff's reagent
 - Tollen's reagent
27. Propene is the product obtained by dehydrogenation of [KCET (Engg.) 2001]
- 2-propanol
 - 1-propanol
 - Propanal
 - n*-propyl alcohol
28. Which of the following statements is correct [BHU 1997]
- Phenol is less acidic than ethyl alcohol
 - Phenol is more acidic than ethyl alcohol
 - Phenol is more acidic than carboxylic acid
 - Phenol is more acidic than carbonic acid
29. Boiling point of alcohol is comparatively higher than that corresponding alkane due to [MH CET 2002]
- Intermolecular hydrogen bonding
 - Intramolecular hydrogen bonding
 - Volatile nature

- (d) None of these
30. When Phenol is heated with phthalic anhydride in concentrated sulphuric acid and the hot reaction mixture is poured into a dilute solution of sodium hydroxide, the product formed is [MP PET 1997, 2003; RPMT 1999; KCET (Med.) 2000; CPMT 1981; CBSE PMT 1988]
- (a) Alizarin (b) Methyl orange
(c) Fluorescein (d) Phenolphthalein
31. $CH_3 - CH = CH - CH(OH) - CH_3 \xrightarrow[\text{reagent}]{\text{Jon's}}$ X,
Product X is [RPET 2000]
- (a) $CH_3CH_2CH_2CH(OH)CH_3$
(b) $CH_3CH = CHCOCH_3$
(c) Both (a) and (b) are correct
(d) $CH_3CH_2CH_2COCH_3$
32. Reaction: $CH_3OH + O_2 \xrightarrow[Ag]{600^\circ C}$ product
The product is [RPET 2000]
- (a) $CH_2 = C = O$ (b) $H_2C = O$
(c) C_2H_4 (d) C_2H_2
33. Ethylene glycol, on oxidation with per-iodic acid, gives [NCERT 1983; CPMT 1983]
- (a) Oxalic acid (b) Glycol
(c) Formaldehyde (d) Glycollic acid
34. An unknown compound 'D', first oxidised to aldehyde and then acitic acid by a dilute solution of $K_2Cr_2O_7$ and H_2SO_4 . The unknown compound 'D' is [BHU 2000]
- (a) CH_3CHO (b) CH_2CH_3OH
(c) CH_3CH_2OH (d) $CH_3CH_2CH_3$
35. The reaction of ethylene glycol with PI_3 gives [MP PMT 2000]
- (a) ICH_2CH_2I (b) $CH_2 = CH_2$
(c) $CH_2 = CHI$ (d) $ICH = CHI$
36. The compound 'A' when treated with ceric ammonium nitrate solution gives yellow ppt. The compound 'A' is [MP PET 2002]
- (a) Alcohol (b) Aldehyde
(c) Acid (d) Alkane
37. Which of the following product is formed, when ether is exposed to air [AIIMS 2000; RPMT 2002]
- (a) Oxide (b) Alkanes
(c) Alkenes (d) Peroxide of diethyl ether
38. During dehydration of alcohols to alkenes by heating with conc. H_2SO_4 the initiation step is [AIEEE 2003]
- (a) Protonation of alcohol molecule
(b) Formation of carbocation
(c) Elimination of water
(d) Formation of an ester
39. Phenol is less acidic than [MNR 1995]
- (a) Ethanol (b) Methanol
(c) o-nitrophenol (d) p-methylphenol
40. The compound which gives the most stable carbonium on dehydration is [MNR 1995]
- (a) $CH_3 - CH - CH_2OH$
 |
 CH_3
 |
 CH_3
(b) $CH_3 - C - OH$
 |
 CH_3
(c) $CH_3 - CH_2 - CH_2 - CH_2OH$
 |
 $CH_3 - CH - CH_2 - CH_3$
(d) OH
41. At higher temperature, iodoform reaction is given by [AIIMS 2003]
- (a) $CH_3CO_2CH_3$ (b) $CH_3CO_2C_2H_5$
(c) $C_6H_5CO_2CH_3$ (d) $CH_3CO_2C_6H_5$
42. Cresol has [CPMT 2003]
- (a) Alcoholic - OH (b) Phenolic - OH
(c) - COOH (d) - CHO
43. In $CH_3CH_2OH \xrightarrow[350^\circ C]{X} CH_2 = CH_2 + H_2O$; 'X' is
- (a) NaCl (b) $CaCl_2$
(c) P_2O_5 (d) Al_2O_3
44. Sodium phenoxide reacts with CO_2 at 400K and 4-7 atm pressure to give [MP PET 1996]
- (a) Sodium salicylate (b) Salicylaldehyde
(c) Catechol (d) Benzoic acid
45. The reaction of C_2H_5OH with H_2SO_4 does not give [MP PET 1996]
- (a) Ethylene (b) Diethyl ether
(c) Acetylene (d) Ethyl hydrogen sulphate
46. The order of stability of carbonium ions is [MP PET 1996]
- (a) Methyl > ethyl > iso-propyl > tert-butyl
(b) Tert-butyl > iso-propyl > ethyl > methyl

- (c) Iso-propyl > tert-butyl > ethyl > methyl
(d) Tert-butyl > ethyl > iso-propyl > methyl
47. Which statement is not correct about alcohol [AFMC 1997]
(a) Alcohol is lighter than water
(b) Alcohol evaporates quickly
(c) Alcohol of less no. of carbon atoms is less soluble in water than alcohol of high no. of carbon atoms
(d) All of these
48. An organic compound A reacts with sodium metal and forms B. On heating with conc. H_2SO_4 , A gives diethyl ether. A and B are [AFMC 1998]
(a) C_2H_5OH and C_2H_5ONa
(b) C_3H_7OH and CH_3ONa
(c) CH_3OH and CH_3ONa
(d) C_4H_9OH and C_4H_9ONa
49. In the Liebermann's nitroso reaction, sequential changes in the colour of phenol occurs as [AFMC 1998; BHU 1999]
(a) Brown or red \rightarrow green \rightarrow red \rightarrow deep blue
(b) Red \rightarrow deep blue \rightarrow green
(c) Red \rightarrow green \rightarrow white
(d) White \rightarrow red \rightarrow green
50. Which one of the following reactions does not yield an alkyl halide [EAMCET 1998]
(a) Diethyl ether + Cl_2
(b) Diethyl ether + HI
(c) Diethyl ether and PCl_5
(d) Diethyl ether $\xrightarrow{\text{Reduction}} X \xrightarrow{SO_2Cl_2}$
51. Compound A reacts with PCl_5 to give B which on treatment with KCN followed by hydrolysis gave propionic acid. What is A and B respectively [EAMCET 1998]
(a) C_3H_8 and C_3H_7Cl
(b) C_2H_6 and C_2H_5Cl
(c) C_2H_5Cl and C_2H_5Cl
(d) C_2H_5OH and C_2H_5Cl
52. The increasing order of acidity among phenol, *p*-methylphenol, *m*-nitrophenol and *p*-nitrophenol is [CBSE PMT 1995; RPMT 2002]
(a) *m*-nitrophenol, *p*-nitrophenol, phenol, *p*-methylphenol
(b) *p*-methylphenol, *m*-nitrophenol, phenol, *p*-nitrophenol
(c) *p*-methylphenol, phenol, *m*-nitrophenol, *p*-nitrophenol
(d) Phenol, *p*-methylphenol, *p*-nitrophenol, *m*-nitrophenol
53. Which of the following is not characteristic of alcohols [AFMC 1992]
(a) Lower alcohols are stronger and have bitter taste
(b) Higher alcohols are stronger and have bitter taste
(c) The boiling points of alcohols increase with increasing molecular mass
(d) The lower alcohols are soluble in water
54. In reaction of alcohols with alkali metal, acid etc. which of the following alcohol will react fastest [BHU 1984]
(a) Secondary (b) Tertiary
(c) Primary (d) All equal
55. Order of reactivity of alcohols towards sodium metal is [Pb. CET 1985]
(a) *Pri* > *Sec* > *Ter* (b) *Pri* > *Sec* < *Ter*
(c) *Pri* < *Sec* > *Ter* (d) *Pri* < *Sec* < *Ter*
56. 23 g of Na will react with methyl alcohol to give [NCERT 1972]
(a) One mole of oxygen (b) One mole of H_2
(c) $\frac{1}{2}$ mole of H_2 (d) None of these
57. Which reagent is useful in converting 1-butanol to 1-bromobutane [EAMCET 1989]
(a) $CHBr_3$ (b) Br_2
(c) CH_3Br (d) PBr_3
58. The $-OH$ group of methyl alcohol cannot be replaced by chlorine by the action of [KCET 1989]
(a) Chlorine
(b) Hydrogen chloride
(c) Phosphorus trichloride
(d) Phosphorus pentachloride
59. Which of the following gives ketone on oxidation [EAMCET 1987; BIT 1992]
(a) $(CH_3)_3COH$ (b) $CH_3CH_2CH_2OH$
(c) $(CH_3)_2CHCH_2OH$ (d) $CH_3CHOHCH_3$
60. Phenol is treated with bromine water and shaken well. The white precipitate formed during the process is [KCET (Med.) 2001; BIT 1992; AIIMS 1996; KCET 2001]
(a) *m*-bromophenol
(b) 2, 4-dibromophenol
(c) 2, 4, 6-tribromophenol
(d) A mixture of *o*- and *p*-bromophenols
61. Which compound has the highest boiling point [MP PET 2003]
(a) Acetone (b) Diethyl ether
(c) Methanol (d) Ethanol

- (c) HCOOH (d) CH_3COOH
76. Ethyl alcohol on oxidation with $\text{K}_2\text{Cr}_2\text{O}_7$ gives
[MNR 1987; Bihar CEE 1995; UPSEAT 2000]
(a) Acetic acid (b) Acetaldehyde
(c) Formaldehyde (d) Formic acid
77. Lucas test is used for
[CBSE PMT 1990; AIIMS 2002; AFMC 2005]
(a) Alcohols (b) Amines
(c) Diethyl ether (d) Glacial acetic acid
78. When phenol reacts with ammonia in presence of ZnCl_2 at 300°C , it gives
[AFMC 2001]
(a) Primary amine (b) Secondary amine
(c) Tertiary amine (d) Both (b) and (c)
79. Azo-dyes are prepared from
[CPMT 2001]
(a) Aniline (b) Benzaldehyde
(c) Benzoic acid (d) Phenol
80. A compound that easily undergoes bromination is
[KCET (Engg.) 2002]
(a) Phenol (b) Toluene
(c) Benzene (d) Benzoic acid
81. Which of the following has lowest boiling point
[MH CET 1999]
(a) *p*-nitrophenol (b) *m*-nitrophenol
(c) *o*-nitrophenol (d) phenol
82. In esterification, the reactivity of alcohols is
[DPMT 2000]
(a) $1^\circ > 2^\circ > 3^\circ$ (b) $3^\circ > 2^\circ > 1^\circ$
(c) Same in all cases (d) None of these
83. The role of conc. H_2SO_4 in the esterification process is
[RPMT 1999]
(a) Catalyst
(b) Dehydrating agent
(c) Hydrolysing agent
(d) Dehydrating agent and catalyst
84. Methanol and ethanol are distinguished by the
[MP PET 1999]
(a) Action of HCl (b) Iodoform test
(c) Solubility in water (d) Sodium
85. For phenol, which of the following statements is correct
[MP PMT 1995]
(a) It is insoluble in water
(b) It has lower melting point compared to aromatic hydrocarbons of comparable molecular weight
(c) It has higher boiling point than toluene
(d) It does not show acidic property
86. The reaction of Lucas reagent is fast with [MP PMT 2000]
(a) $(\text{CH}_3)_3\text{COH}$ (b) $(\text{CH}_3)_2\text{CHOH}$
(c) $\text{CH}_3(\text{CH}_2)_2\text{OH}$ (d) $\text{CH}_3\text{CH}_2\text{OH}$
87. Which of the following reagents convert the propene to 1-propanol
[CBSE PMT 2000]
(a) H_2O , H_2SO_4
(b) Aqueous KOH
(c) MgSO_4 , $\text{NaBH}_4 / \text{H}_2\text{O}$
(d) B_2H_6 , H_2O_2 , OH^-
88. Compound 'A' reacts with PCl_5 to give 'B' which on treatment with KCN followed by hydrolysis gave propanoic acid as the product. What is 'A' [CBSE PMT 2002]
(a) Ethane (b) Propane
(c) Ethyl chloride (d) Ethyl alcohol
89. Which reagent can convert acetic acid into ethanol
[BVP 2003]
(a) Na + alcohol (b) LiAlH_4 + ether
(c) H_2 + Pt (d) Sn + HCl
90. Which of the following would undergo dehydration most readily
[UPSEAT 2000]
(a) 1-phenyl-1-butanol (b) 2-phenyl-2-butanol
(c) 1-phenyl-2-butanol (d) 2-phenyl-1-butanol
91. Phenol and benzoic acid is distinguished by [BHU 2003]
(a) NaOH (b) NaHCO_3
(c) Na_2CO_3 (d) H_2SO_4
92. Electrophilic substitution reaction in phenol take place at
[RPMT 2002]
(a) *p*- position (b) *m*- position
(c) *o*- position (d) *o*- and *p*- position
93. Liebermann's test is answered by [KCET 1998]
(a) Aniline (b) Methylamine
(c) Ethyl benzoate (d) Phenol
94. In the sequence of the following reactions [MP PMT 2002]
$$\text{CH}_3\text{CH}_2\text{OH} \xrightarrow[\text{ChromicAcid}]{[\text{O}]} \text{X} \xrightarrow[\text{ChromicAcid}]{[\text{O}]} \text{CH}_3\text{COOH}$$

 X is
(a) CH_3COCH_3 (b) CH_3CHO
(c) CH_3OCH_3 (d) $\text{CH}_3\text{CH}_2\text{COOH}$

95. The boiling point of glycerol is more than propanol because of [CPMT 1997, 2002]
 (a) Hydrogen bonding (b) Hybridisation
 (c) Resonance (d) All the above
96. Which of the following produces violet colour with $FeCl_3$ solution
 (a) Enols (b) Ethanol
 (c) Ethanal (d) Alkyl halides
97. When heated with NH_3 under pressure alone or in presence of zinc chloride phenols are converted into [RPMT 1997]
 (a) Aminophenols (b) Aniline
 (c) Nitrobenzene (d) Phenyl hydroxylamine
98. Because of resonance the oxygen atom of $-OH$ group of phenol
 (a) Acquires positive charge (b) Acquires negative charge
 (c) Remains unaffected (d) Liberates
99. When glycerol is heated with $KHSO_4$ it gives [CPMT 1974, 85; MP PMT 1988, 90, 91, 92, 94; MP PET 1988, 92]
 (a) $CH_2 = CH - CH_3$ (b) $CH_2 = CH - CH_2OH$
 (c) $CH_2 = CH - CHO$ (d) $CH_2 = C = CH_2$
100. An organic compound X on treatment with acidified $K_2Cr_2O_7$ gives a compound Y which reacts with I_2 and sodium carbonate to form tri-iodomethane. The compound X is [KCET 1996]
 (a) CH_3OH (b) $CH_3 - CO - CH_3$
 (c) CH_3CHO (d) $CH_3CH(OH)CH_3$
101. The reaction of conc. HNO_3 and phenol forms [MP PMT/PET 1988; BHU 1988; MP PMT 1999; Pb. PMT 2000]
 (a) Benzoic acid (b) Salicylic acid
 (c) *o*-and *p*-nitrophenol (d) Picric acid
102. Phenol is [MP PMT 1990; UPSEAT 1999]
 (a) A weaker base than NH_3
 (b) Stronger than carbonic acid
 (c) Weaker than carbonic acid
 (d) A neutral compound
103. Phenol at $25^\circ C$ is
 (a) A white crystalline solid (b) A transparent liquid
 (c) A gas (d) Yellow solution
104. At low temperature phenol reacts with Br_2 in CS_2 to form [MP PET 1991; CPMT 1981; MP PMT 1990; IIT 1982; RPMT 2000]
 (a) *m*-bromophenol (b) *o*-and *p*-bromophenol
 (c) *p*-bromophenol (d) 2, 4, 6-tribromophenol
105. Oxidation of ethanol by chromic acid forms [MP PET 1992]
 (a) Ethanol (b) Methanol
 (c) 2-propanone (d) Ethanoic acid
106. Which of the following not gives effervescence with $NaHCO_3$ [MP PET 1992]
 (a) Phenol (b) Benzoic acid
 (c) 2, 4-dinitrophenol (d) 2, 4, 6-trinitrophenol
107. Conc. H_2SO_4 reacts with C_2H_5OH at $170^\circ C$ to form [MP PMT 1991; MP PET 1991; IIT-JEE 1981; EAMCET 1979; KCET 2001]
 (a) CH_3COCH_3 (b) CH_3COOH
 (c) CH_3CHO (d) C_2H_4
108. Which compound has hydrogen bonding [MP PMT 1992; MP PET 1991]
 (a) Toluene (b) Phenol
 (c) Chlorobenzene (d) Nitrobenzene
109. Which statement is true [MP PMT 1991]
 (a) C_6H_5OH is more acidic than C_2H_5OH
 (b) C_6H_5OH is less acidic than C_2H_5OH
 (c) C_6H_5OH react with $NaHCO_3$
 (d) C_6H_5OH gives oxime with NH_2OH and HCl
110. Read the following statements carefully :
 (A) A secondary alcohol on oxidation gives a ketone
 (B) Ethanol reacts with conc. H_2SO_4 at $180^\circ C$ to yield ethylene
 (C) Methanol reacts with iodine and sodium hydroxide to give a yellow precipitate of iodoform
 (D) Hydrogen gas is liberated when sodium is added to alcohol. Select the correct statements from the above set:
 (a) A, B (b) C, D
 (c) A, B, D (d) A, C, D
111. The following reaction :

 is known as [MP PET 1997]
 (a) Perkin reaction

- (b) Gattermann reaction
(c) Kolbe reaction
(d) Gattermann-Koch reaction
- 112.** Carbylamine test is done by heating alcoholic KOH with
[IIT-JEE 1984; BIT 1992; CBSE PMT 1992]
(a) Chloroform and silver powder
(b) Trihalogen methane and primary amine
(c) Alkyl halide and primary amine
(d) Alkyl cyanide and primary amine
- 113.** Isopropyl alcohol heated at $300^{\circ}C$ with copper catalyst to form [AFMC 1990; MP PMT 1986, 89, 92; JIPMER 2000]
(a) Acetone (b) Dimethyl ether
(c) Acetaldehyde (d) Ethane
- 114.** Dehydrogenation of $\begin{array}{c} CH_3-CH-CH_3 \\ | \\ OH \end{array}$ gives
[MP PMT 2002]
(a) Acetone (b) Acetaldehyde
(c) Acetic acid (d) Acetylene
- 115.** In the sequence of the following reactions
 $CH_3OH \xrightarrow{HI} CH_3I \xrightarrow{KCN} CH_3CN \xrightarrow{\text{reduction}} X \xrightarrow{HNO_3} Y$
 X and Y are respectively [MP PMT 2002]
(a) $CH_3CH_2NH_2$ and CH_3CH_2OH
(b) $CH_3CH_2NH_2$ and CH_3COOH
(c) CH_3CH_2OH and CH_3CHO
(d) CH_3OCH_3 and CH_3CHO
- 116.** Alcohols (i) $CH_3CH_2CH_2OH$, (ii) $CH_3-CHOH-CH_3$ and (iii) $CH_3-C(CH_3)(OH)-CH_3$ were treated with Lucas reagent (Conc. $HCl + ZnCl_2$). What results do you expect at room temperature
(a) (ii) and (iii) react immediately and (i) in about 5 minutes
(b) (iii) reacts immediately, (ii) reacts in about 5 minutes and (i) not at all
(c) (i) reacts immediately, (ii) reacts in about 5 minutes and (iii) not at all
(d) (i) reacts in about 5 minutes, (ii) reacts in about 15 minutes and (iii) not at all
- 117.** Ethylene may be obtained by dehydration of which of the following with concentrated H_2SO_4 at $160 - 170^{\circ}C$
[DPMT 2000; MP PET 2001]
(a) C_2H_5OH (b) CH_3OH
(c) $CH_3CH_2CH_2OH$ (d) $(CH_3)_2CHCH_2OH$
- 118.** The final product of the oxidation of ethyl alcohol is [KCET (Med.) 1999]
(a) Ethane (b) Acetone
(c) Acetaldehyde (d) Acetic acid
- 119.** The compound obtained by heating salicylic acid with phenol in the presence of phosphorus oxychloride is [KCET (Med.) 1999]
(a) Salol (b) Aspirin
(c) Oil of wintergreen (d) o -chlorobenzoyl chloride
- 120.** When phenol is allowed to react with Br_2 in (i) CS_2 solution and (ii) in aqueous solution, the resulting compounds are
(a) (i) 2, 4, 6-tribromophenol and (ii) o - and p -bromophenol
(b) (i) m -bromophenol and (ii) 2, 3, 4-tribromophenol
(c) (i) o - and p -bromophenol and (ii) 2, 4, 6-tribromophenol
(d) (i) o - and m -bromophenol and (ii) 2, 3, 4-tribromophenol
- 121.** Which of the following is not true in case of reaction with heated copper at $300^{\circ}C$ [CPMT 1999]
(a) Phenol \rightarrow Benzyl alcohol
(b) Primary alcohol \rightarrow Aldehyde
(c) Secondary alcohol \rightarrow Ketone
(d) Tertiary alcohol \rightarrow Olefin
- 122.** Which of the following is the most suitable method for removing the traces of water from ethanol [CPMT 1999]
(a) Heating with Na metal
(b) Passing dry HCl through it
(c) Distilling it
(d) Reacting with Mg
- 123.** With oxalic acid, glycerol at $260^{\circ}C$ gives [BHU 1996]
(a) Allyl alcohol (b) Glyceryl mono-oxalate
(c) Formic acid (d) Glyceraldehyde
- 124.** Absolute alcohol cannot be prepared by fractional distillation of rectified spirit since
(a) It forms azeotropic mixture
(b) It is used as power alcohol
(c) It is used in wines
(d) None of the above
- 125.** The reagent used for the dehydration of an alcohol is

[MP PET/PMT 1998]

- (a) Phosphorus pentachloride
- (b) Calcium chloride
- (c) Aluminium oxide
- (d) Sodium chloride

126. Which one of the following compounds gives a positive iodoform test [MP PMT 1997]

- (a) Pentanal
- (b) 1-phenyl ethanol
- (c) 2-phenyl ethanol
- (d) 3-pentanol

127. What amount of bromine will be required to convert 2 g of phenol into 2, 4, 6-tribromophenol [MP PET/PMT 1998]

- (a) 4.00
- (b) 6.00
- (c) 10.22
- (d) 20.44

128. Ethyl alcohol exhibits acidic character on reacting with [MP PMT 1995]

- (a) Acetic acid
- (b) Sodium metal
- (c) Hydrogen iodide
- (d) Acidic potassium dichromate

129. The mixture of ethanol and water cannot be separated by distillation because [KCET 1984]

- (a) They form a constant boiling mixture
- (b) Alcohol molecules are solvated
- (c) Their boiling points are very near
- (d) Alcohol remains dissolved in water

130. The reaction between an alcohol and an acid with the elimination of water molecule is called [MH CET 1999]

- (a) Esterification
- (b) Saponification
- (c) Etherification
- (d) Elimination

131. The compound with the highest boiling point is [MNR 1985]

- (a) CH_4
- (b) CH_3OH
- (c) CH_3Cl
- (d) CH_3Br

132. The boiling point of ethyl alcohol should be less than that of [Pb. CET 1985]

- (a) Propane
- (b) Formic acid
- (c) Dimethyl ether
- (d) None of these

133. Which of the following is not characteristic of alcohols [AIIMS 1980]

- (a) They are lighter than water
- (b) Their boiling points rise fairly uniformly with increasing molecular weight

- (c) Lower members are insoluble in water and organic solvents but solubility regularly increases with molecular weight
- (d) Lower members have pleasant smell and burning taste, while higher members are odourless and tasteless

134. At room temperature the alcohol that do not reacts with Lucas reagent is

- (a) Primary alcohol
- (b) Secondary alcohol
- (c) Tertiary alcohol
- (d) All these three

135. By means of calcium chloride which of following can be dried

- (a) Methanol
- (b) Ethanol
- (c) Both (a) and (b)
- (d) None of these

136. Lucas test is used to distinguish between [MP PET 1994]
(a) 1° , 2° and 3° alcohols (b) 1° , 2° and 3° amines

- (c) Aldehydes and ketones
- (d) Alkenes and alkynes

137. Among the following, the compound that undergoes nitration readily is [NCERT 1984]

- (a) Benzoic acid
- (b) Toluene
- (c) Phenol
- (d) Nitrobenzene

138. Phenol $\xrightarrow[\text{Distillation}]{Zn} A \xrightarrow[\text{Conc. HNO}_3]{\text{Conc. H}_2\text{SO}_4} B \xrightarrow[\text{NaOH}]{Zn} C$

In the above reaction A, B and C are the following compounds [MP PMT/PET 1988]

- (a) C_6H_6 , $C_6H_5NO_2$ and aniline
- (b) C_6H_6 , dinitrobenzene and metanitroaniline
- (c) Toluene, metanitrobenzene and metatoluedine
- (d) C_6H_6 , $C_6H_5NO_2$ and hydrazobenzene

139. $CH_3 - O - C_3H_7$ and $C_2H_5 - O - C_2H_5$ exhibit which type of isomerism [MP PMT 1989]

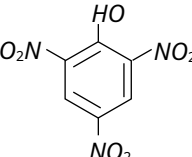
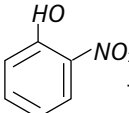
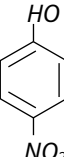
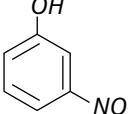
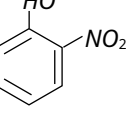
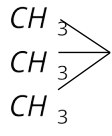
- (a) Metamerism
- (b) Position
- (c) Chain
- (d) Functional

140. Phenol reacts with CCl_4 in presence of aqueous alkali and forms a product which on hydrolysis gives [MP PMT 1990]

- (a) Salicylaldehyde
- (b) Salicylic acid
- (c) Benzaldehyde
- (d) Benzoic acid

141. In fermentation by zymase, alcohol and CO_2 are obtained from the following sugar [MP PMT/PET 1988]

- (a) Glucose
- (b) Invert sugar
- (c) Fructose
- (d) All of these

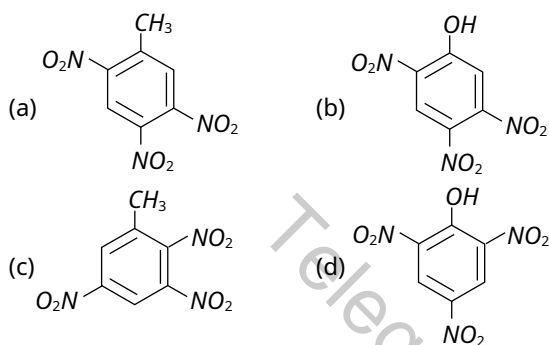
142. The order of melting point of *ortho*, *para*, *meta*-nitrophenol is [Orissa JEE 2003]
 (a) $o > m > p$ (b) $p > m > o$
 (c) $m > p > o$ (d) $p > o > m$
143. The alcohol which does not give a stable compound on dehydration is [MP PET 1997]
 (a) Ethyl alcohol (b) Methyl alcohol
 (c) *n*-propyl alcohol (d) *n*-butyl alcohol
144. When ethyl alcohol (C_2H_5OH) is mixed with ammonia and passed over heated alumina, the compound formed is [DPMT 1981; CBSE PMT 1989]
 (a) $C_2H_5NH_2$ (b) C_2H_4
 (c) $C_2H_5OC_2H_5$ (d) CH_3OCH_3
145. A mixture of methanol vapours and air is passed over heated copper. The products are [KCET 1988]
 (a) Carbon monoxide and hydrogen
 (b) Formaldehyde and water vapour
 (c) Formic acid and water vapour
 (d) Carbon monoxide and water vapour
146. In the esterification reaction of alcohols [Bihar CEE 1995]
 (a) OH^- is replaced by CH_3COO group
 (b) OH^- is replaced by chlorine
 (c) H^- is replaced by sodium metal
 (d) OH^- is replaced by C_2H_5OH
147. A compound A on oxidation gave acetaldehyde, then again on oxidation gave acid. After first oxidation it was reacted with ammoniacal $AgNO_3$ then silver mirror was produced. A is likely to be [DPMT 1996]
 (a) Primary alcohol (b) Tertiary alcohol
 (c) Acetaldehyde (d) Acetone
148. Phenol $\xrightarrow[H^+]{CHCl_3/NaOH}$ Salicylaldehyde
 The above reaction is known as [Pb. PMT 2002]
 (a) Reimer Tiemann reaction
 (b) Bucherer reaction
 (c) Gattermann synthesis
 (d) Perkin reaction
149. Alcohol which gives red colour with Victor Meyer test is [RPMT 2003]
 (a) C_2H_5OH (b) $CH_3 - \underset{\substack{| \\ OH}}{CH} - CH_3$
 (c) $C(CH_3)_3OH$ (d) None of these
150. Conc. H_2SO_4 heated with excess of C_2H_5OH at $140^\circ C$ to form [MP PMT 1990; RPMT 2000; AFMC 2002]
 (a) $CH_3CH_2 - O - CH_3$
 (b) $CH_3CH_2 - O - CH_2CH_3$
 (c) $CH_3 - O - CH_2 - CH_2 - CH_3$
 (d) $CH_2 = CH_2$
151. Rate of substitution reaction in phenol is [MP PMT 1989]
 (a) Slower than the rate of benzene
 (b) Faster than the rate of benzene
 (c) Equal to the rate of benzene
 (d) None of these
152. Phenol reacts with dilute HNO_3 at normal temperature to form [MP PMT 1989]
 (a) 
 (b)  + 
 (c) 
 (d) 
153. One mole of phenol reacts with bromine to form tribromophenol. How much bromine is used [MP PMT 1989]
 (a) 1.5 mol (b) 3 mol
 (c) 4.5 mol (d) 6 mol
154. In presence of $NaOH$, phenol react with $CHCl_3$ to form *o*-hydroxy benzaldehyde. This reaction is called [BIT 1992; MP PMT 1990, 2002; AIIMS 1992; MP PET 1994; JIPMER 1999]
 (a) Reimer-Tiemann's reaction
 (b) Sandmeyer's reaction
 (c) Hoffmann's degradation reaction
 (d) Gattermann's aldehyde synthesis
155. Which of the following vapours passed over heated copper to form acetone [BIT 1992]
 (a) $H_3C - CH_2 - CH_2OH$
 (b) $CH_3 - \underset{\substack{| \\ OH}}{CH} - CH_3$
 (c)  - OH
 (d) $CH_2 = CH - CH_2OH$

156. Methyl alcohol (methanol), ethyl alcohol (ethanol) and acetone (propanone) were treated with iodine and sodium hydroxide solutions. Which substances will give iodoform test

- (a) Only ethyl alcohol
(b) Only methyl alcohol and ethyl alcohol
(c) Only ethyl alcohol and acetone
(d) Only acetone

157. TNT has the structure

[UPSEAT 2000]



158. The vapour pressure of aqueous solution of methanal is

[UPSEAT 2000]

- (a) Equal to water (b) Equal to methanal
(c) More than water (d) Less than water

159. Glycerol reacts with conc. HNO_3 and conc. H_2SO_4 to form

[CPMT 1983; MP PMT/PET 1988]

- (a) Glycerol mononitrate (b) Glycerol dinitrate
(c) Glycerol trinitrate (d) Acrolein

160. Glycerol heated with oxalic acid at $110^\circ C$ to form

[CPMT 1986, 90, 91, 97; JIPMER 1997]

- (a) Formic acid (b) Oxalic acid
(c) Allyl alcohol (d) Glycerol trioxalate

161. Dimethyl ether and ethyl alcohol are

[CPMT 1986; Manipal MEE 1995]

- (a) Branched isomer (b) Position isomer
(c) Functional isomer (d) Tautomer

162. The process of manufacture of absolute alcohol from rectified spirit is

[CPMT 1986, 87; Kurukshetra CEE 2002]

- (a) Fractional distillation (b) Steam distillation
(c) Azeotropic distillation (d) Vacuum distillation

163. When ethyl alcohol reacts with acetic acid, the products formed are

[CPMT 1989]

- (a) Sodium ethoxide + hydrogen
(b) Ethyl acetate + water
(c) Ethyl acetate + soap
(d) Ethyl alcohol + water

164. Picric acid is (at $25^\circ C$)

- (a) A white solid (b) A colourless liquid
(c) A gas (d) A bright yellow solid

165. Phenol on distillation with zinc dust gives

[MP PET 1991; CPMT 1997; MP PMT 1999, 2001;

Pb. PMT 2000]

- (a) C_6H_6 (b) C_6H_{12}
(c) $C_6H_5OC_6H_5$ (d) $C_6H_5 - C_6H_5$

166. Methanol and ethanol are miscible in water due to

[MP PET/PMT 1988; CPMT 1989; CBSE PMT 1991]

- (a) Covalent character
(b) Hydrogen bonding character
(c) Oxygen bonding character
(d) None of these

167. By distilling glycol with fuming sulphuric acid, which of following is obtained

- (a) Glycerol (b) Pinacol
(c) Dioxan (d) Ethylene oxide

168. The compound which gives the most stable carbonium ion on dehydration is

[DCE 2000]

- (a) $CH_3 - \underset{\substack{| \\ CH_3}}{CH} - CH_2OH$
(b) $CH_3 - \underset{\substack{| \\ CH_3}}{C} - OH$
(c) $CH_3 - CH_2 - CH_2 - CH_2OH$
(d) $CH_3 - \underset{\substack{| \\ CH_3}}{CH} - CH_2 - CH_3$

169. In CH_3CH_2OH which bond dissociates heterolytically

[IIT-JEE 1988; CPMT 1996]

- (a) C - C (b) C - O
(c) C - H (d) O - H

170. Which compound is soluble in water

[IIT-JEE 1980; CPMT 1993; RPET 1999]

- (a) CS_2 (b) C_2H_5OH
(c) CCl_4 (d) $CHCl_3$

171. Which of the following is most soluble in water

[MP PMT 1995]

- (a) Normal butyl alcohol (b) Isobutyl alcohol
(c) Tertiary butyl alcohol (d) Secondary butyl alcohol

172. Which of the following gives negative iodoform test

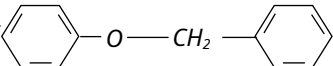
- (a) CH_3CH_2OH (b) $CH_3CH_2CH_2OH$
(c) $C_6H_5 - \underset{\substack{| \\ OH}}{CH} - CH_3$ (d) $CH_3 - \underset{\substack{| \\ OH}}{CH} - CH_3$

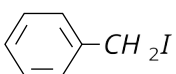
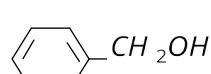
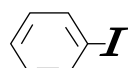
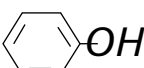
173. If ethanol dissolves in water, then which of the following would be done [MP PET 1989]
 (a) Absorption of heat and contraction in volume
 (b) Emission of heat and contraction in volume
 (c) Absorption of heat and increase in volume
 (d) Emission of heat and increase in volume
174. A migration of hydrogen with a pair of electrons is called
 (a) Alkyl shift (b) Hydride shift
 (c) Hydrogen ion formation (d) Dehydrogenation
175. When rectified spirit and benzene are distilled together, the first fraction obtained is
 (a) A ternary azeotrope (b) Absolute alcohol
 (c) A binary azeotrope (d) Denatured spirit
176. Alcohols react with Grignard reagent to form [DPMT 1986]
 (a) Alkanes (b) Alkenes
 (c) Alkynes (d) All of these
177. Action of diazomethane on phenol liberates
 (a) O_2 (b) H_2
 (c) N_2 (d) CO_2
178. The ring deuteration of phenol
 (a) Lowers the acidity
 (b) Increases the acidity
 (c) Imparts no effect
 (d) Causes amphoteric nature
179. In esterification of an acid, the other reagent is [CPMT 1988]
 (a) Aldehyde (b) Alcohol
 (c) Amine (d) Water
180. Maximum solubility of alcohol in water is due to [MP PMT/ PET 1988; MP PMT 1989]
 (a) Covalent bond (b) Ionic bond
 (c) H-bond with H_2O (d) None of the above
181. Alcohols can be distinguished from alkenes by
 (a) Dissolving in cold concentrated H_2SO_4
 (b) Decolourizing with bromine in CCl_4
 (c) Oxidizing with neutral permanganate solution
 (d) None of the above
182. At $25^\circ C$ Ethylene glycol is a
 (a) Solid compound (b) Liquid
 (c) Gas (d) Brown solid
183. When primary alcohol is oxidised with chlorine, it produces [AFMC 1999]
 (a) $HCHO$ (b) CH_3CHO
 (c) CCl_3CHO (d) C_3H_7CHO
184. Alcohols combine with acetylene in the presence of mercury compounds as catalyst to form
 (a) Acetals (b) Xanthates
 (c) Vinyl ethers (d) None of the above
185. The compound which will give negative iodoform test is [CPMT 1993, 99]
 (a) CH_3CHO (b) CH_3CH_2OH
 (c) Isopropyl alcohol (d) Benzyl alcohol
186. Which of the following is most acidic [CPMT 1999]
 (a) Phenol (b) Benzyl alcohol
 (c) *m*-chlorophenol (d) Cyclohexanol
187. Number of metamers represented by molecular formula $C_4H_{10}O$ is [Tamil Nadu CET 2001]
 (a) 4 (b) 3
 (c) 2 (d) 1
188. When ether is exposed in air for sometime an explosive substance produced is [RPMT 2002]
 (a) Peroxide (b) TNT
 (c) Oxide (d) Superoxide
189. Ether which is liquid at room temperature is [BVP 2002]
 (a) $C_2H_5OCH_3$ (b) CH_3OCH_3
 (c) $C_2H_5OC_2H_5$ (d) None of these
190. In the following reaction

$$C_2H_5OC_2H_5 + 4[H] \xrightarrow{\text{Red P + HI}} 2X + H_2O, X \text{ is}$$
 [MP PMT 2002]
 (a) Ethane (b) Ethylene
 (c) Butane (d) Propane
191. Diethyl ether absorbs oxygen to form [DPMT 1984]
 (a) Red coloured sweet smelling compound
 (b) Acetic acid
 (c) Ether suboxide
 (d) Ether peroxide
192. Diethyl ether can be decomposed by heating with [CPMT 1980, 81, 89]
 (a) HI (b) $NaOH$
 (c) Water (d) $KMnO_4$
193. On boiling with concentrated hydrobromic acid, phenyl ethyl ether will yield [AIIMS 1992]
 (a) Phenol and ethyl bromide
 (b) Phenol and ethane
 (c) Bromobenzene and ethanol
 (d) Bromobenzene and ethane

194. Ether is formed when ethyl alcohol is heated with conc. H_2SO_4 . The conditions are [KCET 1984]

- (a) Excess of H_2SO_4 and $170^\circ C$
- (b) Excess of C_2H_5OH and $140^\circ C$
- (c) Excess of C_2H_5OH and $180^\circ C$
- (d) Excess of conc. H_2SO_4 and $100^\circ C$

195. The ether  when treated with HI produces [IIT-JEE 1999]

- (a) 
- (b) 
- (c) 
- (d) 

196. Addition of alcohols to aldehydes in presence of anhydrous acids yield [CET Pune 1998]

- (a) Carboxylic acids
- (b) Ethers
- (c) Cyclic ethers
- (d) Acetals

197. In which of the following reaction, phenol or sodium phenoxide is not formed [CPMT 1996]

- (a) $C_6H_5N_2Cl + aq. KOH \rightarrow$
- (b) $C_6H_5OCl + NaOH \rightarrow$
- (c) $C_6H_5N_2Cl + aq. NaOH \rightarrow$
- (d) $C_6H_5NNCl \xrightarrow[\Delta]{H_2O}$

198. Dimethyl ether when heated with excess HI gives [CPMT 1996]

- (a) CH_3I and CH_3OH
- (b) CH_3I and H_2O
- (c) $C_2H_6 + CH_3I$ and CH_3OH
- (d) CH_3I and $HCHO$

199. The ether that undergoes electrophilic substitution reactions is [IPMER 2001]

- (a) $CH_3OC_2H_5$
- (b) $C_6H_5OCH_3$
- (c) CH_3OCH_3
- (d) $C_2H_5OC_2H_5$

200. Acetyl chloride does not react with [MNR 1995]

- (a) Diethyl ether
- (b) Aniline
- (c) Phenol
- (d) Ethanol

201. The products formed in the following reaction

$C_6H_5-O-CH_3 + HI \xrightarrow{\text{heat}}$ are [IIT 1995]

- (a) C_6H_5-I and CH_3-OH
- (b) C_6H_5-OH and CH_3-I
- (c) $C_6H_5-CH_3$ and HOI
- (d) C_6H_6 and CH_3OI

202. Etherates are

- (a) Ethers
- (b) Solution in ether
- (c) Complexes of ethers with Lewis acid
- (d) Complexes of ethers with Lewis base

203. An ether is more volatile than an alcohol having the same molecular formula. This is due to [AIEEE 2003]

- (a) Dipolar character of ethers
- (b) Alcohols having resonance structures
- (c) Inter-molecular hydrogen bonding in ethers
- (d) Inter-molecular hydrogen bonding in alcohols

204. When ether is reacted with O_2 , it undergoes explosion due to [CPMT 1996]

- (a) Peroxide
- (b) Acid
- (c) Ketone
- (d) TNT

205. The compound which does not react with sodium is [CBSE PMT 1994]

- (a) C_2H_5OH
- (b) CH_3-O-CH_3
- (c) CH_3COOH
- (d)

$CH_3-CHOH-CH_3$

206. Methyl-terbutyl ether on heating with HI of one molar concentration gives [MP PET 1997]

- (a) $CH_3I + (CH_3)_3COH$
- (b)

$CH_3OH + (CH_3)_3Cl$

- (c) $CH_3I + (CH_3)_3Cl$
- (d) None of the above

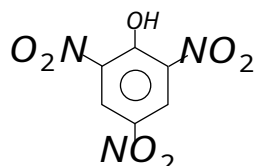
207. A substance $C_4H_{10}O$ yields on oxidation a compound C_4H_8O which gives an oxime and a positive iodoform test. The original substance on treatment with conc. H_2SO_4 gives C_4H_8 . The structure of the compound is [SCRA 2000]

- (a) $CH_3CH_2CH_2CH_2OH$
- (b) $CH_3CH(OH)CH_2CH_3$
- (c) $(CH_3)_3COH$
- (d) $CH_3CH_2-O-CH_2CH_3$

208. Ethylene glycol reacts with excess of PCl_5 to give [Kerala PMT 2004]

- (a) 1, 1-dichloroethane
- (b) 1, 2-dichloroethane
- (c) 1, 1, 1-trichloroethane
- (d) 1, 1, 2, 2-tetrachloroethane
- (e) 2, 2-dichloroethane

209. Which of the following will not react with NaOH [CPMT 2004]



(a) C_2H_5OH

(c) CH_3CONH_2 (d) $CH(CN)_3$

210. The boiling point of methanol is greater than that of methyl thiol because [Kerala PMT 2004]

- (a) There is intramolecular hydrogen bonding in methanol and intermolecular hydrogen bonding in methyl thiol
 (b) There is intermolecular hydrogen bonding in methanol and no hydrogen bonding in methyl thiol
 (c) There is no hydrogen bonding in methanol and intermolecular hydrogen bonding in methyl thiol
 (d) There is intramolecular hydrogen bonding in methanol and no hydrogen bonding in methyl thiol
 (e) There is no hydrogen bonding in methanol and intramolecular hydrogen bonding in methyl thiol

211. In the reaction $\begin{array}{c} CH_2OH \\ | \\ CHOH \\ | \\ CH_2OH \end{array} + \begin{array}{c} COOH \\ | \\ COOH \end{array} \xrightarrow{110^\circ C} (A)$ product (A)

will be

[Pb. CET 2001]

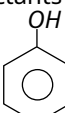
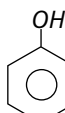
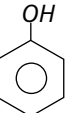
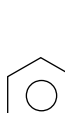
- (a) Glycerol monoformate
 (b) Allyl alcohol
 (c) Formaldehyde
 (d) Acetic acid

212. Which of the following will not form a yellow precipitate on heating with an alkaline solution of iodine

[CBSE PMT 2004]

- (a) CH_3OH
 (b) CH_3CH_2OH
 (c) $CH_3CH(OH)CH_3$
 (d) $CH_3CH_2CH(OH)CH_3$

213. In Friedal-Crafts acylation, besides $AlCl_3$, the other reactants are [DPMT 2004]

- (a)  + CH_3Cl (b)  + CH_3COCl
 (c)  + HN_3 (d)  + CH_3Cl

214. Which of the following reagents will produce salicylaldehyde on reaction with phenol [DPMT 2004]

- (a) $CHCl_3 / NaOH$ (b) $CCl_4 / NaOH$
 (c) $CH_2Cl_2 / NaOH$ (d) $CH_3Cl / NaOH$

215. At 530 K, glycerol reacts with oxalic acid to produce [Pb. CET 2002]

- (a) Allyl alcohol (b) Formic acid
 (c) Glyceraldehyde (d) Glycerol monooxalate

216. With anhydrous zinc chloride, ethylene glycol gives [MP PMT 2004]

- (a) Formaldehyde (b) Acetylene
 (c) Acetaldehyde (d) Acetone

217. Which of the following compound give yellow precipitate with I_2 and $NaOH$ [Pb. CET 2003]

- (a) CH_3OH (b) $CH_3CH_2CH_2OH$
 (c) $C_2H_5OC_2H_5$ (d) CH_3CH_2OH

218. Amongst the following, HBr reacts fastest with [IIT-JEE 1986; JIPMER 2000; DCE 2003]

- (a) Propane-1-ol (b) Propane-2-ol
 (c) 2-methyl propane-1-ol (d) 2-methyl propane-2-ol

219. Which of the following react with benzoic acid to form ethyl benzoate [Pb. CET 2001]

- (a) Ethyl alcohol (b) Cinnamic acid
 (c) Sodium ethoxide (d) Ethyl chloride

220. When phenyl magnesium bromide reacts with *t*-butanol, the product would be

- (a) Benzene (b) Phenol
 (c) *t*-butyl benzene (d) *t*-butyl ether

221. Which of the following is used as catalyst for preparing Grignard reagent [Pb. CET 2002]

- (a) Iron powder (b) Dry ether
 (c) Activated charcoal (d) MnO_2

222. Ethyl alcohol is heated with conc. H_2SO_4 . The product formed is [DCE 2004]

- (a) $CH_3 - \overset{O}{\parallel} C - OC_2H_5$ (b) C_2H_6
 (c) C_2H_4 (d) C_2H_2

223. Dehydration of 2-butanol yield [Pb. CET 2004]

- (a) 1-butene (b) 2-butene
 (c) 2-butyne (d) Both (a) and (b)

224. Fats, on alkaline hydrolysis, gives [MH CET 2003]

- (a) Oils (b) Soaps
 (c) Detergents (d) Glycol + acid

225. When vapours of an alcohol are passed over hot reduced copper, alcohol is converted into alkene quickly, the alcohol is [CPMT 1985]

- (a) Primary (b) Secondary
(c) Tertiary (d) None of these

226. The adduct of the compound 'A' obtained by the reaction with excess of isopropyl magnesium iodide, upon hydrolysis gives a tertiary alcohol. The compound 'A' is [MP PET 1985]

- (a) An ester (b) A secondary alcohol
(c) A primary alcohol (d) An aldehyde

227. If there be a compound of the formula $CH_3C(OH)_3$ which one of the following compounds would be obtained from it without reaction with any reagent [CPMT 1983]

- (a) CH_3OH (b) C_2H_5OH
(c) CH_3COOH (d) $HCHO$

228. Which of the following can work as a dehydrating agent for alcohols [BHU 1980]

- (a) H_2SO_4 (b) Al_2O_3
(c) H_3PO_4 (d) All of these

229. What is formed when glycerol reacts with HI [DCE 2002]

- (a) $\begin{array}{c} CH_2OH \\ | \\ CHI \\ | \\ CH_2OH \end{array}$ (b) $\begin{array}{c} CH_2 \\ || \\ CH \\ | \\ CH_2I \end{array}$
(c) $\begin{array}{c} CH_3 \\ | \\ CH_2 \\ | \\ CH_3 \end{array}$ (d) $\begin{array}{c} CH_2OH \\ | \\ C=O \\ | \\ CH_3 \end{array}$

230. The dehydration of 2-methyl butanol with conc. H_2SO_4 gives [UPSEAT 2004]

- (a) 2-methyl butene as major product
(b) Pentene
(c) 2-methyl but-2-ene as major product
(d) 2-methyl pent-2-ene

231. Which alcohol reacts with fatty acids to form fats [MP PMT/PET 1988; MP PET 1991]

- (a) Ethanol (b) Glycerol
(c) Methanol (d) Isopropanol

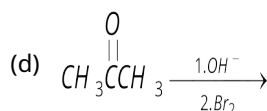
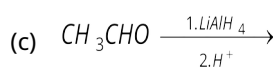
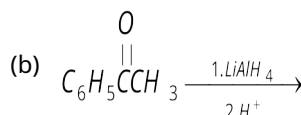
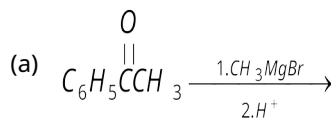
232. Which will dehydrate easily [Roorkee 1995]

- (a) 3-methyl-2-butanol (b) Ethyl alcohol
(c) 2-methyl propane-2-ol (d) 2-methyl butanol-2

233. $A \xleftarrow[\Delta]{Cu} CH_3CH_2OH \xrightarrow[\Delta]{Al_2O_3} B$. A and B respectively are [RPMT/PET 2000]

- (a) Alkene, alkanal (b) Alkyne, alkanal
(c) Alkanal, alkene (d) Alkene, alkyne

234. Which one of the following reactions would produce secondary alcohol [MP PET 1994]



235. On reaction with hot conc. H_2SO_4 , which one of the following compounds loses a molecule of water [CPMT 1989]

- (a) CH_3COCH_3 (b) CH_3COOH
(c) CH_3OCH_3 (d) CH_3CH_2OH

236. The best method to prepare cyclohexene from cyclohexanol is by using [IIT 2005]

- (a) Conc. $HCl + ZnCl_2$ (b) Conc. H_3PO_4
(c) HBr (d) Conc. HCl

237. Which of the following compound is most acidic [BCECE 2005]

- (a) CH_4 (b) C_2H_6
(c) $CH \equiv CH$ (d) C_2H_5OH

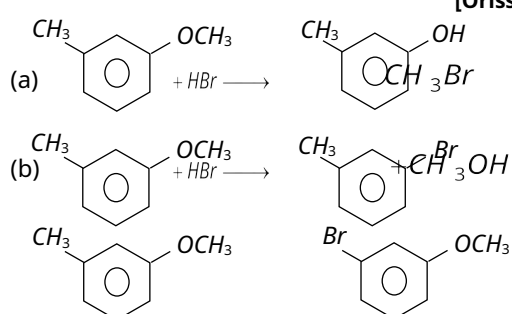
238. C_2H_5OH can be differentiated from CH_3OH by [MP PMT 1994]

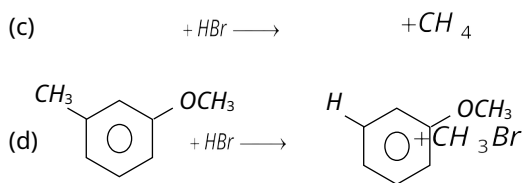
- (a) Reaction with HCl (b) Reaction with NH_3
(c) By iodoform test (d) By solubility in water

239. A compound does not react with 2,4 di-nitrophenyl hydrazine and Na , compound is [UPSEAT 2003]

- (a) Acetone (b) Acetaldehyde
(c) CH_3OH (d) $CH_2=CHOCH_3$

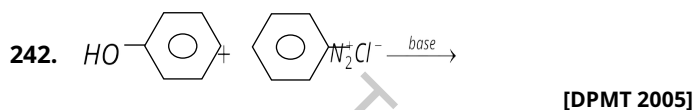
240. Which of the following reaction is correctly represented [Orissa JEE 2005]

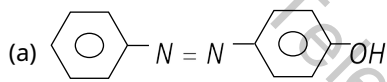
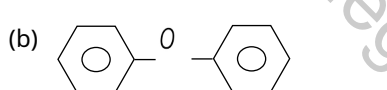






241. Tertiary butyl alcohol gives tertiary butyl chloride on treatment with [Orissa JEE 2005]

- (a) Conc. HCl / anhydrous $ZnCl_2$
 (b) KCN
 (c) $NaOCl$
 (d) Cl_2



- (a) 
 (b) 
 (c) 
 (d) 

243. In which of the following reactions carbon carbon bond formation takes place [DPMT 2005]

- (a) Cannizzaro (b) Reimer-Tiemann
 (c) HVZ reaction (d) Schmidt reaction

244. Reaction of phenol with chloroform/sodium hydroxide to give *o*-hydroxy benzaldehyde involves the formation of [J & K 2005]

- (a) Dichloro carbene (b) Trichloro carbene
 (c) Chlorine atoms (d) Chlorine molecules

245. Which is not correct [J & K 2005]

- (a) Phenol is more acidic than acetic acid
 (b) Ethanol is less acidic than phenol
 (c) Ethanol has lower boiling point than ethane
 (d) Ethyne is a non-linear molecule

Uses of alcohol, Phenol and Ethers

- Glycerol is used in the manufacture of [SCRA 1991]
 (a) Dynamite (b) Varnish
 (c) Paints (d) Soft drinks
- Glycerol as a triester present in [MP PMT 1990]
 (a) Petroleum (b) Kerosene
 (c) Vegetable oil and fat (d) Naphtha
- In presence of air, fermentation of ethyl alcohol by azotobacter bacteria forms [MP PMT 1989]

- (a) $CH_2 = CH_2$ (b) C_2H_6
 (c) CH_3CHO (d) CH_3COOH

- Aspirin is also known as [CPMT 1989, 94; MP PET 1995]
 (a) Methyl salicylic acid (b) Acetyl salicylic acid
 (c) Acetyl salicylate (d) Methyl salicylate
- Substances used in bringing down the temperature in high fevers are called [DPMT 1983]
 (a) Pyretics (b) Antipyretics
 (c) Antibiotics (d) Antiseptics
- When glycol is heated with dicarboxylic acid, the products are
 (a) Polyesters (b) Polyethers
 (c) Polyethylene (d) No reaction at all
- Cresol is [BHU 1996]
 (a) A mixture of three cresols with little phenol
 (b) Used as dye for wood
 (c) A soapy solution of cresols
 (d) Having an aldehyde group
- Phenol is used in the manufacture of [AIIMS 1996]
 (a) Bakelite (b) Polystyrene
 (c) Nylon (d) PVC
- In cold countries ethylene glycol is added to water in the radiators to [CPMT 1971; NCERT 1971; MP PMT 1993]
 (a) Bring down the specific heat of water
 (b) Lower the viscosity
 (c) Reduce the viscosity
 (d) Make water a better lubricant
- Power alcohol is [KCET 1990]
 (a) An alcohol of 95% purity
 (b) A mixture of petrol hydrocarbons and ethanol
 (c) Rectified spirit
 (d) A mixture of methanol and ethanol
- 4-chloro-3, 5-dimethyl phenol is called [KCET 2003]
 (a) Chloramphenicol (b) Paracetamol
 (c) Barbital (d) Dettol
- Alcoholic fermentation is brought about by the action of [CPMT 1977, 79, 88; DPMT 1983]
 (a) CO_2 (b) O_2
 (c) Invertase (d) Yeast
- Rectified spirit is a mixture of [DPMT 1982; MP PMT 1976, 77, 96; CPMT 1976, 77, 90; KCET 1990]
 (a) 95% ethyl alcohol + 5% water
 (b) 94% ethyl alcohol + 4.53% water
 (c) 94.4% ethyl alcohol + 5.43% water
 (d) 95.57% ethyl alcohol + 4.43% water
- Methyl alcohol is toxic. The reason assigned is [RPET 2000]
 (a) It stops respiratory track
 (b) It reacts with nitrogen and forms CN^- in the lungs

- (c) It increases CO_2 content in the blood
(d) It is a reduction product of formaldehyde
15. Glycerol is used [Kurukshetra CET 2002]
(a) As a sweetening agent
(b) In the manufacture of good quality soap
(c) In the manufacture of nitro glycerine
(d) In all of these
16. Glycerol is not used in which of following cases
(a) Explosive making (b) Shaving soap making
(c) As an antifreeze for water (d) As an antiseptic agent
17. Liquor poisoning is due to [CPMT 1971]
(a) Presence of bad compound in liquor
(b) Presence of methyl alcohol
(c) Presence of ethyl alcohol
(d) Presence of carbonic acid
18. In order to make alcohol undrinkable pyridine and methanol are added to it. The resulting alcohol is called
(a) Power alcohol (b) Proof spirit
(c) Denatured spirit (d) Poison alcohol
19. Denatured spirit is mainly used as a [MNR 1995; MP PET 2002]
(a) Good fuel
(b) Drug
(c) Solvent in preparing varnishes
(d) Material in the preparation of oil
20. Main constituent of dynamite is [MP PET 1992; BHU 1979]
(a) Nitrobenzene (b) Nitroglycerine
(c) Picric acid (d) TNT
21. Wine (alcoholic beverages) contains [CPMT 1972, 77; BHU 1996; AFMC 2001]
(a) CH_3OH (b) Glycerol
(c) $\text{C}_2\text{H}_5\text{OH}$ (d) 2-propanol
22. Tonics in general contain [MNR 1995]
(a) Ether (b) Methanol
(c) Ethanol (d) Rectified spirit
23. Widespread deaths due to liquor poisoning occurs due to [DPMT 2001]
(a) Presence of carbonic acid in liquor
(b) Presence of ethyl alcohol in liquor
(c) Presence of methyl alcohol in liquor
(d) Presence of lead compounds in liquor
24. Diethyl ether finds use in medicine as [KCET 1989]
(a) A pain killer (b) A hypnotic
(c) An antiseptic (d) An anaesthetic
25. Washing soap can be prepared by saponification with alkali of the oil [CPMT 1986]
(a) Rose oil (b) Paraffin oil

- (c) Groundnut oil (d) Kerosene
26. Ether can be used [CPMT 1982]
(a) As a general anaesthetic (b) As a refrigerant
(c) In perfumery (d) All of these
27. The Bouveault-Blanc reduction involves [MP PET 1991]
(a) $\text{C}_2\text{H}_5\text{OH} / \text{Na}$ (b) LiAlH_4
(c) $\text{C}_2\text{H}_5\text{MgX}^-$ (d) Zn / HCl
28. Which is used as an antifreeze [AFMC 1992]
(a) Glycol (b) Ethyl alcohol
(c) Water (d) Methanol

Critical Thinking

Objective Questions

1. Which will undergo a Friedel-Craft's alkylation reaction [Pb. PMT 1998]
- 1

2

3

4
- (a) 1, 2 and 4 (b) 1 and 3
(c) 2 and 4 (d) 1 and 2
2. The product 'A' in the following reaction is [MP PMT 2003]
- $$\begin{array}{c} \text{H}_2\text{C} - \text{CH}_2 \\ \diagdown \quad \diagup \\ \text{O} \end{array} \xrightarrow{\text{RMgI}} \text{A}$$
- (a) RCHOHR (b) $\text{RCHOH} \cdot \text{CH}_3$
(c) $\text{R} - \text{CH}_2 - \text{CH}_2 - \text{OH}$ (d) $\text{R} - \text{CH}(\text{R}) - \text{CH}_2\text{OH}$
3. Glycerol boils at 290°C with slight decomposition. Impure glycerine can be purified by [CPMT 1983, 94]
(a) Steam distillation (b) Simple distillation
(c) Vacuum distillation (d) Extraction with a solvent
4. Phenol $\xrightarrow{\text{NaNO}_2 / \text{H}_2\text{SO}_4} \text{B} \xrightarrow{\text{H}_2\text{O}} \text{C} \xrightarrow{\text{NaOH}} \text{D}$
Name of the above reaction is [KCET 2003]
(a) Liebermann's reaction
(b) Phthalein fusion test
(c) Reimer-Tiemann reaction
(d) Schottenf-Baumann reaction
5. The correct order of boiling point for primary (1°), secondary (2°) and tertiary (3°) alcohols is [CPMT 1999; RPMT 2002]
(a) $1^\circ > 2^\circ > 3^\circ$ (b) $3^\circ > 2^\circ > 1^\circ$
(c) $2^\circ > 1^\circ > 3^\circ$ (d) $2^\circ > 3^\circ > 1^\circ$

6. What will be the products of reaction if methoxybenzene reacts with HI
 (a) Methyl alcohol (methanol) + iodobenzene
 (b) Methyl iodide (iodomethane) + benzene
 (c) Methyl iodide + phenol
 (d) Methyl iodide + iodobenzene
7. Ethylene reacts with Baeyer's reagent to give [CPMT 1988]
 (a) Ethane (b) Ethyl alcohol
 (c) Ethylene glycol (d) None of these
8. Which of the following statements is correct regarding case of dehydration in alcohols [CPMT 1980, 85; MP PMT 2001; BHU 2002]
 (a) Primary > Secondary (b) Secondary > Tertiary
 (c) Tertiary > Primary (d) None of these
9. Oxiran is
 (a) Ethylene oxide (b) Diethyl ether
 (c) Ethyl glycolate (d) Glycolic ester
10. Propan-1-ol can be prepared from propene by alcohol [AIIMS 2003]
 (a) H_2O / H_2SO_4
 (b) $Hg(OAc)_2 / H_2O$ followed by $NaBH_4$
 (c) B_2H_6 followed by H_2O_2
 (d) CH_3CO_2H / H_2SO_4
11. Distinction between primary, secondary and tertiary alcohol is done by [MP PMT/PET 1988; RPMT 2000]
 (a) Oxidation method
 (b) Lucas test
 (c) Victor Meyer method
 (d) All of these
12. Oxidation of which of the following by air in presence of vanadium pentoxide gives phenol
 (a) Toluene (b) Benzene
 (c) Benzaldehyde (d) Phenyl acetic acid
13. The most suitable method of the separation of a 1 : 1 mixture of *ortho* and *para* nitrophenols is [CBSE PMT 1994, 99; CPMT 1997]
 (a) Distillation (b) Sublimation
 (c) Crystallization (d) Chromatography
14. Which of the following does not form phenol or phenoxide [AFMC 2000]
 (a) C_6H_5Cl (b) C_6H_5COOH
 (c) $C_6H_5N_2Cl$ (d) $C_6H_5SO_3Na$
15. Which of the following will be obtained by keeping ether in contact with air for a long time [RPMT 2003]
 (a) $C_2H_5 - O - CH(CH_3) - O - OH$
 (b) $C_2H_5 - OCH_2 - OH$
 (c) $C_2H_5 - O - C_2H_5OH$
 (d) $CH_3 - OCH(CH_3) - O - OH$
16. When a mixture of ethanol and methanol is heated in the presence of concentrated H_2SO_4 the resulting organic product or products is/are [Manipal MEE 1995]
 (a) $CH_3OC_2H_5$
 (b) CH_3OCH_3 and $C_2H_5OC_2H_5$
 (c) $CH_3OC_2H_5$ and CH_3OCH_3
 (d) $CH_3OC_2H_5$, CH_3OCH_3 and $C_2H_5OC_2H_5$
17. In the following groups
 I $-OAc$ II $-OMe$ III $-OSO_2Me$
 IV $-OSO_2CF_3$
 The order of leaving group ability is [IIT 1997]
 (a) $I > II > III > IV$
 (b) $IV > III > I > II$
 (c) $III > II > I > IV$
 (d) $II > III > IV > I$
18. Epoxides are
 (a) Cyclic ethers
 (b) Not ethers
 (c) Aryl-alkyl ethers
 (d) Ethers with another functional group
19. The reaction of $CH_3CH=CH-C_6H_4-OH$ with HBr gives [IIT-JEE 1998]
 (a) $CH_3CHBrCH_2-C_6H_4-OH$
 (b) $CH_3CH_2CHBr-C_6H_4-OH$
 (c) $CH_3CHBrCH_2-C_6H_4-Br$
 (d) $CH_3CH_2CHBr-C_6H_4-Br$
20. Which of the following compounds on boiling with $KMnO_4$ (alk.) and subsequent acidification will not give benzoic acid [KCET 2001]
 (a) Benzyl alcohol (b) Acetophenone
 (c) Anisole (d) Toluene
21. The best reagent to convert pent-3-en-2-ol into pent-3-in-2-one is [AIEEE 2005]
 (a) Acidic permanganate
 (b) Acidic dichromate
 (c) Chromic anhydride in glacial acetic acid
 (d) Pyridinium chloro-chromate
22. When alcohol reacts with concentrated H_2SO_4 intermediate compound formed is [AFMC 2005]

- (a) Carbonium ion (b) Alkoxy ion
(c) Alkyl hydrogen sulphate (d) None of these



Assertion & Reason

For AIIMS Aspirants

Read the assertion and reason carefully to mark the correct option out of the options given below:

- (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
(c) If assertion is true but reason is false.
(d) If the assertion and reason both are false.
(e) If assertion is false but reason is true.

- Assertion : A triester of glycerol and palmitic acid on boiling with aqueous NaOH gives a solid cake having soapy touch.
Reason : Free glycerol is liberated which is a greasy solid. [AIIMS 1996]
- Assertion : Phenol is a weak acid than ethanol.
Reason : Groups with + M effect and - I effect decrease acidity at p -position. [AIIMS 2002]
- Assertion : Phenol is more reactive than benzene towards electrophilic substitution reaction.
Reason : In the case of phenol, the intermediate carbocation is more resonance stabilized. [IIT-JEE (Screening) 2000]
- Assertion : Phenol undergo Kolbe reaction, ethanol does not.
Reason : Phenoxide ion is more basic than ethoxide ion. [AIIMS 1994]
- Assertion : Lucas reagent is a mixture of anhydrous ZnCl_2 and concentrate HCl .
Reason : Primary alcohol produce ppt. with Lucas reagents. [AIIMS 1995]
- Assertion : Resorcinol turns FeCl_3 solution purple.
Reason : Resorcinol have phenolic group. [AIIMS 2000]
- Assertion : Glycerol is purified by distillation under reduced pressure.
Reason : Glycerol is a trihydric alcohol.
- Assertion : Alcohol and phenol can be distinguished by sodium hydroxide.
Reason : Phenol is acidic while alcohol is neutral.
- Assertion : Alcohols are dehydrated to hydrocarbons in the presence of acidic zeolites.
Reason : Zeolites are porous catalysts.

- Assertion : The major products formed by heating $\text{C}_6\text{H}_5\text{CH}_2\text{OCH}_3$ with HI are $\text{C}_6\text{H}_5\text{CH}_3$, I and CH_3OH .
Reason : Benzyl cation is more stable than methyl cation. [AIIMS 2004]
- Assertion : The pK_a of acetic acid is lower than that of phenol.
Reason : Phenoxide ion is more resonance stabilized. [AIIMS 2004]
- Assertion : Alcoholic fermentation involves conversion of sugar into ethyl alcohol by yeast.
Reason : Fermentation involves the slow decomposition of complex organic
- Assertion : The water solubility of the alcohols follow the order t -butyl > s -butyl alcohol > n -butyl alcohol.
Reason : Alcohols form H -bonding with water to show soluble nature.
- Assertion : Absolute ethanol can be obtained by simple fractional distillation of a mixture of alcohol and water.
Reason : The absolute alcohol boils at 78.3°C .
- Assertion : Acid catalysed dehydration of t -butanol is slower than n -butanol.
Reason : Dehydration involves formation of the protonated alcohol, ROH_2^+ .
- Assertion : Tertiary alcohols give turbidity immediately with Lucas reagent.
Reason : A mixture of conc. HI + anhydrous ZnCl_2 is called Lucas reagent.
- Assertion : 4-nitrophenol is more acidic than 2, 4, 6-trinitrophenol.
Reason : Phenol is a weaker acid than carbonic acid.
- Assertion : Phenols cannot be converted into esters by direct reaction with carboxylic acids.
Reason : Electron withdrawing groups increase the acidity of phenols.
- Assertion : $tert$ -butyl alcohol undergoes acid catalysed dehydration readily than propanol.
Reason : 3° alcohols do not give Victor-Meyer's test.
- Assertion : The ease of dehydration of alcohols follows the order. Primary > Secondary > Tertiary.
Reason : Dehydration proceeds through the formation of oxonium ions.
- Assertion : Phenol reacts with acyl halides in presence of pyridine to form phenyl acetate.

- Reason : Benzoylation of phenol is carried out in the presence of NH_4OH .
22. Assertion : Alcohols are easily protonated than phenols.
Reason : Alcohols undergo intermolecular hydrogen bonding due to the presence of highly electronegative oxygen.
23. Assertion : Phenol is less acidic than *p*-nitrophenol.
Reason : Phenolate ion is more stable than *p*-nitrophenolate ion.
24. Assertion : Treatment of phenol with nitrous acid yields *p*-benzoquinone monoxime.
Reason : *p*-nitrosophenol and *p*-benzoquinone monoxime are tautomers.
25. Assertion : Reimer-Tiemann reaction of phenol with CCl_4 in $NaOH$ at 340 K gives salicylic acid as the major product.
Reason : The reaction occurs through intermediate formation of dichlorocarbene.
26. Assertion : Primary and secondary alcohols can be distinguished by Victor-Meyer's test.
Reason : Primary alcohols form nitrolic acid which dissolve in $NaOH$ to form blood red colouration but secondary alcohols form pseudonitrotes which give blue colouration with $NaOH$.
27. Assertion : HIO_4 cleaves 1, 2-glycols but not 1, 3- or higher glycols.
Reason : Only 1, 2- glycols form cyclic esters which subsequently undergo cleavage to form carbonyl compounds.
28. Assertion : Dehydration of glycerol with $KHSO_4$ gives acrolein.
Reason : Acrolein is an α, β -unsaturated aldehyde.
29. Assertion : Both symmetrical and unsymmetrical ethers can be prepared by Williamson's synthesis.
Reason : Williamson's synthesis is an example of nucleophilic substitution reaction.
30. Assertion : Etherates are coordination complexes of ethers with Lewis acids.
Reason : Ethers are easily cleaved by mineral acids such as HCl and H_2SO_4 at 373 K.
31. Assertion : $(CH_3)_3Br$ and CH_3CH_2ONa react to form $(CH_3)_3C-O-CH_2CH_3$.
Reason : Good yields of ethers are obtained when tert-alkyl halides are treated with alkoxides.
32. Assertion : A rate of hydrolysis of methyl chloride to methanol is higher in DMF than in water.

Reason : Hydrolysis of methyl chloride follows second order kinetics. [AIIMS 2005]

33. Assertion : *t*-Butyl methyl ether is not prepared by the reaction of *t*-butyl bromide with sodium methoxide.

Reason : Sodium methoxide is a strong nucleophile. [AIIMS 2005]

Answers

General introduction of alcohol, Phenol & Ethers

1	b	2	d	3	c	4	d	5	a
6	c	7	c	8	b	9	c	10	b
11	b	12	c	13	c	14	a	15	c
16	b	17	b	18	b	19	b	20	b
21	a	22	c	23	a	24	a	25	b
26	a	27	c	28	a	29	c	30	d
31	a	32	b	33	c	34	b	35	d
36	d	37	b	38	a	39	a		

Preparation of alcohol, Phenol and Ethers

1	c	2	c	3	b	4	c	5	d
6	c	7	c	8	d	9	a	10	b
11	c	12	c	13	b	14	b	15	d
16	c	17	b	18	c	19	d	20	b
21	c	22	b	23	c	24	c	25	c
26	d	27	a	28	d	29	b	30	a
31	b	32	b	33	d	34	c	35	d
36	c	37	a	38	a	39	b	40	c
41	b	42	a	43	a	44	c	45	c
46	b	47	c	48	b	49	a	50	b
51	d	52	a	53	d	54	a	55	c
56	a	57	b	58	c	59	b	60	bc
61	a	62	d	63	b	64	a		

Properties of alcohol, Phenol and Ethers

1	c	2	a	3	a	4	c	5	a
6	d	7	d	8	b	9	d	10	c
11	a	12	b	13	c	14	c	15	c
16	b	17	c	18	c	19	d	20	a

21	b	22	b	23	a	24	b	25	c
26	b	27	a	28	b	29	a	30	d
31	b	32	b	33	c	34	c	35	b
36	a	37	d	38	a	39	c	40	b
41	d	42	b	43	d	44	a	45	c
46	b	47	c	48	a	49	a	50	a
51	d	52	c	53	b	54	c	55	a
56	c	57	d	58	a	59	d	60	c
61	d	62	a	63	c	64	b	65	c
66	b	67	d	68	b	69	c	70	b
71	c	72	c	73	a	74	a	75	c
76	a	77	a	78	a	79	d	80	a
81	c	82	a	83	d	84	b	85	c
86	a	87	b	88	d	89	b	90	c
91	b	92	d	93	d	94	b	95	a
96	a	97	b	98	a	99	c	100	d
101	d	102	c	103	a	104	b	105	d
106	a	107	d	108	b	109	a	110	c
111	b	112	b	113	a	114	a	115	a
116	b	117	a	118	d	119	a	120	c
121	a	122	d	123	a	124	a	125	c
126	b	127	c	128	b	129	a	130	a
131	b	132	b	133	c	134	a	135	d
136	a	137	b	138	d	139	a	140	b
141	a	142	b	143	b	144	a	145	b
146	a	147	a	148	a	149	a	150	b
151	b	152	b	153	b	154	a	155	b
156	c	157	d	158	c	159	c	160	a
161	c	162	c	163	b	164	d	165	a
166	b	167	c	168	b	169	d	170	b
171	c	172	b	173	b	174	b	175	a
176	a	177	c	178	a	179	b	180	c
181	b	182	b	183	c	184	a	185	d
186	c	187	b	188	a	189	c	190	a
191	d	192	a	193	a	194	b	195	ad
196	d	197	b	198	b	199	b	200	a
201	b	202	c	203	d	204	a	205	b
206	a	207	b	208	b	209	b	210	b
211	a	212	a	213	b	214	a	215	a

216	c	217	d	218	d	219	a	220	a
221	b	222	a	223	d	224	b	225	c
226	a	227	c	228	d	229	b	230	a
231	b	232	d	233	c	234	b	235	d
236	b	237	d	238	c	239	d	240	a
241	a	242	a	243	b	244	a	245	a

Uses of alcohol, Phenol and Ethers

1	a	2	c	3	d	4	b	5	b
6	a	7	a	8	a	9	a	10	b
11	d	12	d	13	d	14	b	15	d
16	d	17	b	18	c	19	c	20	b
21	c	22	c	23	c	24	d	25	c
26	d	27	a	28	a				

Critical Thinking Questions

1	c	2	c	3	c	4	a	5	a
6	c	7	c	8	c	9	a	10	c
11	d	12	b	13	a	14	b	15	a
16	d	17	b	18	a	19	b	20	c
21	c	22	a						

Assertion & Reason

1	c	2	d	3	a	4	c	5	c
6	a	7	b	8	a	9	b	10	a
11	c	12	a	13	b	14	e	15	e
16	c	17	e	18	b	19	b	20	e
21	c	22	b	23	c	24	b	25	c
26	a	27	a	28	b	29	b	30	c
31	d	32	c	33	b				

ALCOHOLS, PHENOLS, ETHERS

Matching answer type questions:

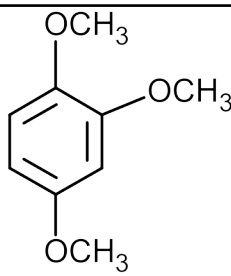
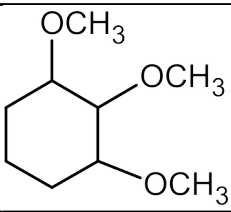
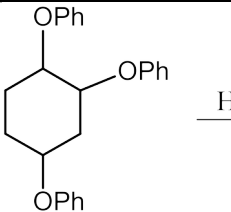
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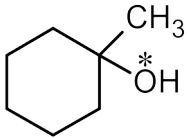
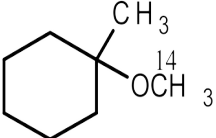
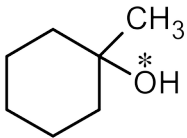
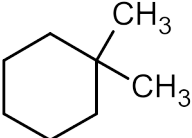
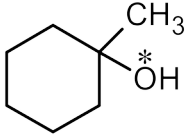
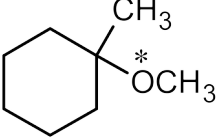
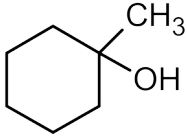
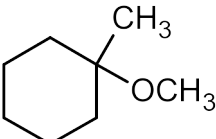
Column I		Column II	
(a)	$\text{C}_6\text{H}_5\text{CH}_2\text{CH}(\text{CH}_3)\text{OH} \xrightarrow{\text{K}} \xrightarrow{\text{C}_2\text{H}_5\text{OTs}} \text{P}$	(p)	Racemisation
(b)	$\text{C}_6\text{H}_5\text{CH}_2\text{CH}(\text{D})\text{OH} \xrightarrow{\text{TsCl}} \xrightarrow{\text{C}_2\text{H}_5\text{ONa}} \text{P}$	(q)	Only retention
(c)	$\text{C}_6\text{H}_5\text{CH}_2\text{CH}(\text{CH}_3)\text{Cl} \xrightarrow{\text{SbF}_5} \text{P}$	(r)	Only inversion
(d)	$\text{C}_6\text{H}_5\text{CH}_2\text{CH}(\text{H})\text{OH} + \text{CH}_3\text{CHDCI} \xrightarrow{\text{Pyridine}} \text{P}$	(s)	Rearrangement

2.

Match the Following:

Column I		Column II	
(a)		(p)	More than 4 moles of HI will be consumed.
(b)		(q)	Product will react with Na.
(c)		(r)	Product formed contains 2° halide.
(d)	$\begin{array}{c} \text{CH}_2 - \text{OH} \\ \\ \text{CH} - \text{OH} \\ \\ \text{CH}_2 - \text{OH} \end{array} \xrightarrow{\text{HI (excess)}}$	(s)	CH ₃ I is one of the products.
		(t)	Diphenyl ketone is one of the products.

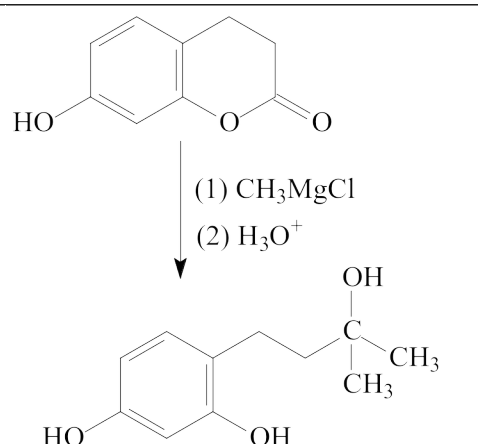
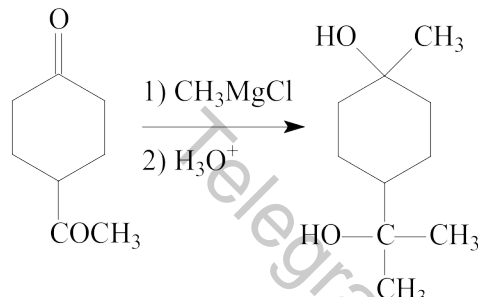
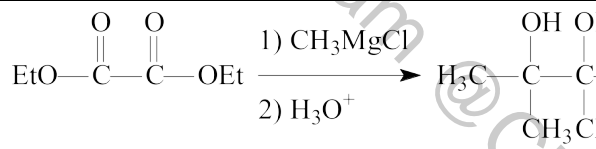
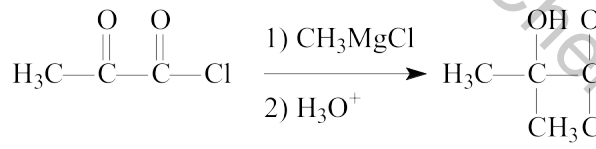
3. Match the Following:

Column I		Column II	
(a)	 $\xrightarrow[2)CH_3OH]{1)H_2SO_4\ conc.}$	(p)	
(b)	 $\xrightarrow[2)CH_3I]{1) NaH}$	(q)	
(c)	 $\xrightarrow[3)CH_3I]{1) HBr, 2)Mg}$	(r)	
(d)	 $\xrightarrow[2)CH_3I]{1) Na}$	(s)	

4. Match the Following:

Column I		Column II	
(a)	Pinacol – pinacolone rearrangement	(p)	six membered cyclic TS
(b)	Claisen – rearrangement	(q)	carbene
(c)	Fries rearrangement	(r)	carbocation
(d)	Reimer – Tiemann reaction	(s)	acylium ion
		(t)	electrophilic aromatic substitution

5.	Column- I Reaction	Column – II No. of moles of CH_3MgCl Reacted
	(A)	(p) 4

				
	(B)		(q)	3
	(C)		(r)	2
	(D)		(s)	5
			(t)	1

6.

Column - I

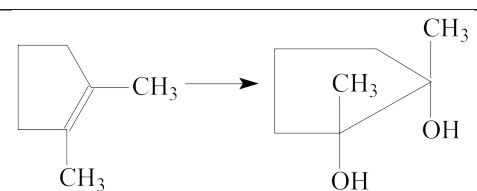
- A) Phenol + Neutral FeCl_3
 B) Phenol + $\text{Br}_2(\text{aq})$
 C) Phenol + NaHCO_3
 D) Picric acid + NaHCO_3

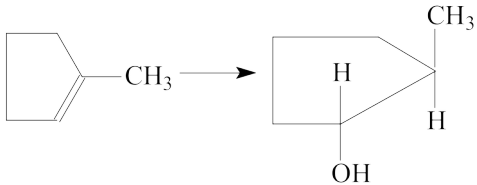
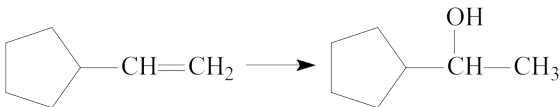
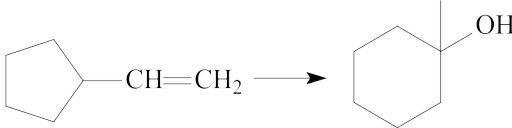
Column - II

- p) No reaction
 q) Violet colour
 r) White Ppt
 s) CO_2 gas is evolved
 t) electrophilic aromatic substitution

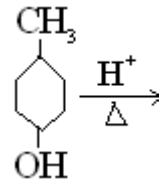
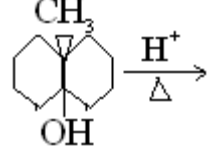
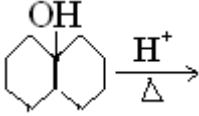
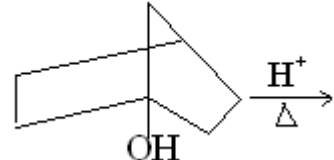
7.

For the following transformations select the suitable reagent (s)

	Column - I		Column - II
(A)		(p)	$\text{B}_2\text{H}_6 / \text{H}_2\text{O}_2, \text{OH}^-$

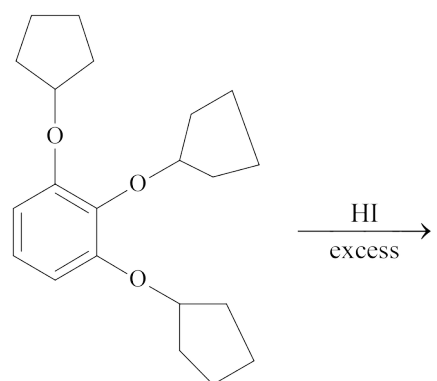
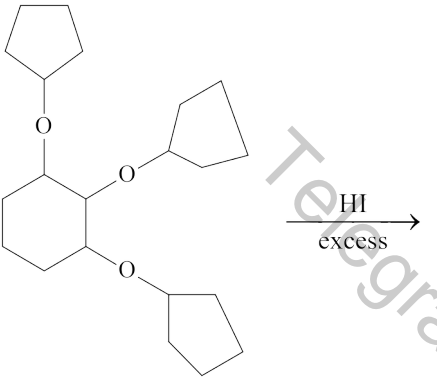
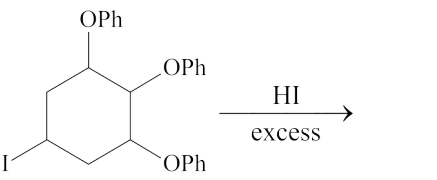
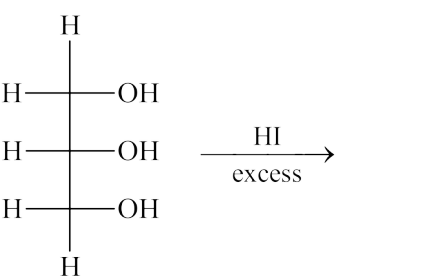
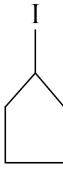
	(B)		(q)	OsO ₄ , H ₂ O ₂
	(C)		(r)	H ₃ O ⁺
	(D)		(s)	Hg(AcO) ₂ , H ₂ O & NaBH ₄
			(t)	Baeyer's reagent

8.

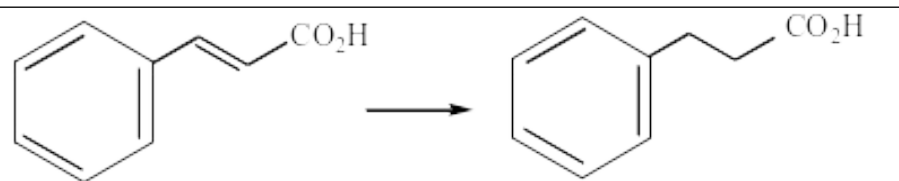
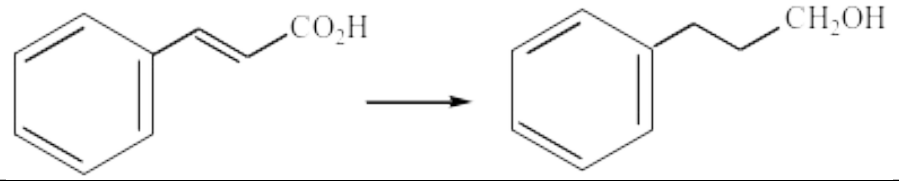
	COLUMN-1		COLUMN-2
a)		P)	Racemic mixture
b)		Q)	Major product consist of even number of α Hydrogen
c)		R)	Will not undergo dehydration
d)		S)	Major product consist of odd number of α-hydrogen

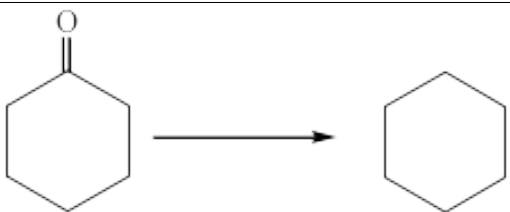
9. Match the following :

Column I	Column II
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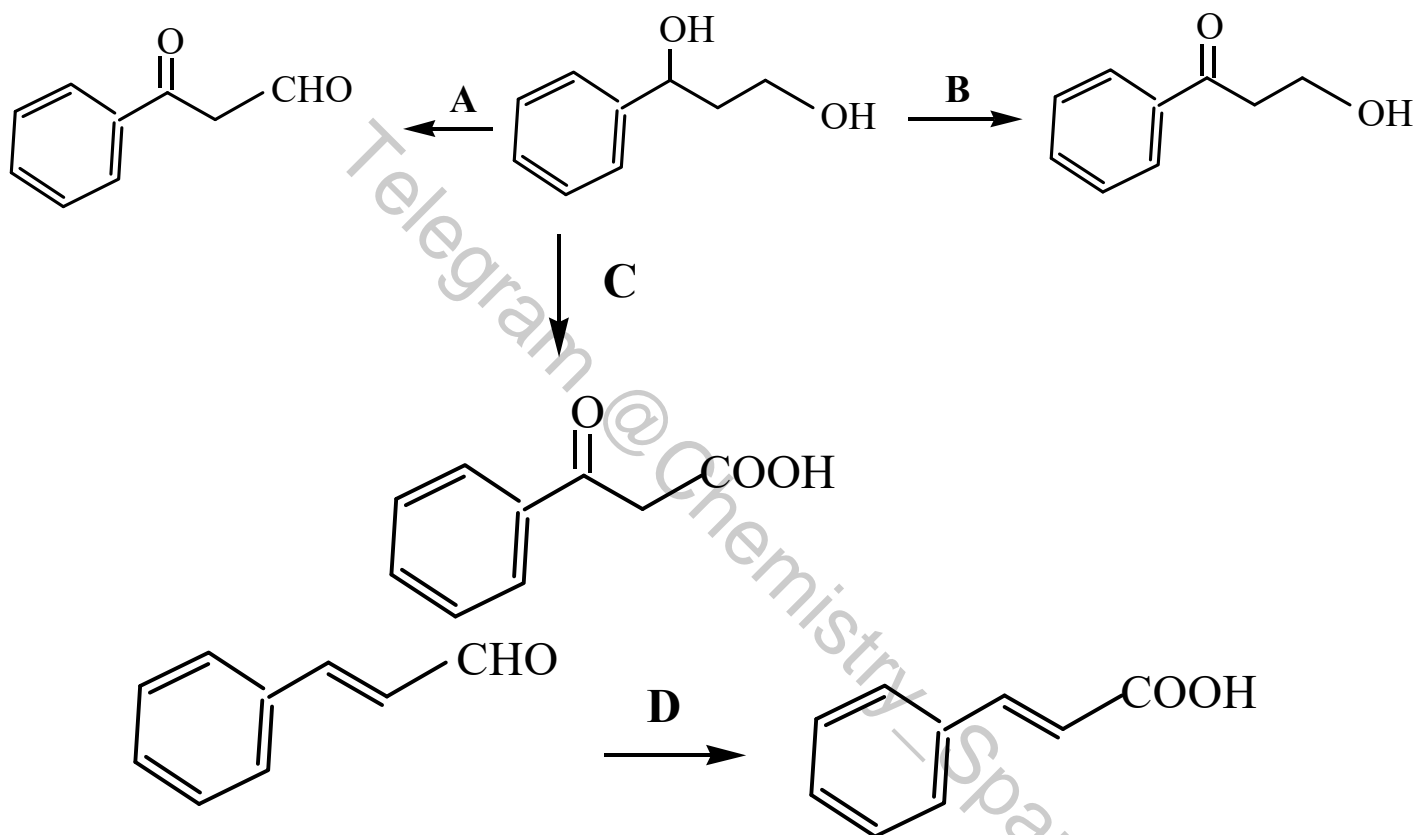
(A)		(p)	More than 4-moles of HI will be consumed.
(B)		(q)	Product which can react with Na
(C)		(r)	Product formed contains 2° halide
(D)		(s)	 is one of the products

10. Match the Coloumn -I with Coloumn -II

Column – I		Column – II	
(A)		(p)	LiAlH ₄
(B)		(q)	H ₂ , Ni, D

(C)		(r)	NaBH ₄
(D)	$\text{CH}_3-\overset{\text{O}}{\underset{\text{O}}{\parallel}}\text{C}-\text{CH}_2-\overset{\text{O}}{\underset{\text{O}}{\parallel}}\text{C}-\text{OC}_2\text{H}_5 \longrightarrow \text{CH}_3\underset{\text{OH}}{\text{CH}}-\text{CH}_2-\overset{\text{O}}{\underset{\text{O}}{\parallel}}\text{C}-\text{OC}_2\text{H}_5$	(s)	Zn - Hg / HCl

11. Study the following oxidation reactions and match the oxidizing agents A, B, C and D, given in column-I and their names in column-II.



Column - I		Column - II	
(A)		(p)	Collins reagent
(B)		(q)	PCC
(C)		(r)	MnO ₂
(D)		(s)	Chromic acid
		(t)	Alkaline KMnO ₄

12. Match the following :

Column - I

- A) Pinacol – pinacolone rearrangement
- B) Claisen – rearrangement
- C) Fries rearrangement

Column - II

- p) six membered cyclic TS
- q) carbene
- r) carbocation

D) Reimer – Tiemann reaction

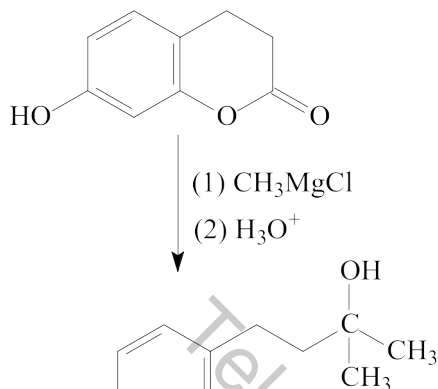
s) acylium ion

t) electrophilic aromatic substitution

13. **Column- I
Reaction**

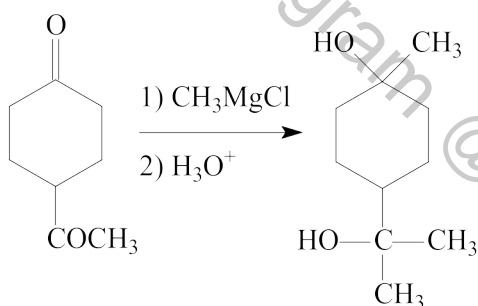
**Column – II
No. of moles of CH_3MgCl
Reacted**

(A)



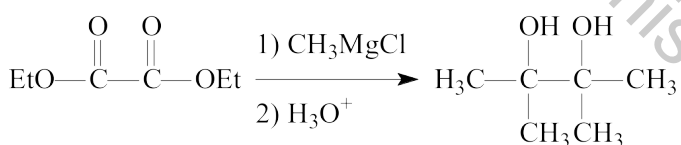
(p) 4

(B)



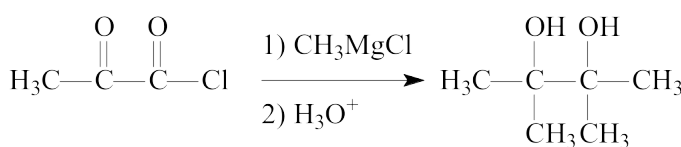
(q) 3

(C)



(r) 2

(D)



(s) 5

14. **Column - I**

- A) Phenol + Neutral FeCl_3
B) Phenol + $\text{Br}_2(\text{aq})$
C) Phenol + NaHCO_3
D) Picric acid + NaHCO_3

(t) 1

Column – II

- p) No reaction
q) Violet colour
r) White PPT
s) CO_2 gas is evolved
t) electrophilic aromatic substitution

15. For the following transformations select the suitable reagent (s)

		Column – I		Column – II
--	--	------------	--	-------------

(A)		(p)	$B_2H_6 / H_2O_2, OH^-$
(B)		(q)	OsO_4, H_2O_2
(C)		(r)	H_3O^+
(D)		(s)	$Hg(AcO)_2, H_2O \text{ \& } NaBH_4$
		(t)	Baeyer's reagent

16. **Column - I (Class of compound)**

- a) $CH_3CH_2CH=CH_2$
 b) $CH_3CH_2C \equiv CH$
 c) C_2H_5OH
 d) C_6H_5OH

Column - II (Detection test)

- p) Ammonical silver nitrate
 q) Halo form reaction
 r) Neutral $FeCl_3$
 s) Br_2 in CCl_4

17. Match the column of I and (II)

Column (I)	Column (II)
(A)	(p) $Ag(NH_3)_2^+$
(B)	(q) MnO_2
(C)	(r) $HCHO, KOH$
(D) $H_3C-CH=CH-\overset{O}{\parallel}C-H \longrightarrow H_3C-CH=CH-COO^-$	(s) SeO_2

18. Match the compounds in column-I with their identification reagent(s)/product(s) that they can form

Column- I

Column- II

- a) 4-(hydroxyl methyl)Phenol p) Bakelite formation

- b) Acetyl acetone
c) 1-phenylethanol
d) phenol

- q) Ceric ammonium nitrate
r) Haloform test
s) FeCl_3

19. **Column – I**

- A) $\begin{array}{c} \text{CH}_2 - \text{CH}_2 \\ | \quad | \\ \text{OH} \quad \text{OH} \end{array} \rightarrow \text{CH}_2 = \text{CH}_2$
B) $\text{CCl}_3 - \text{CH} = \text{O} \rightarrow \text{CHCl}_3 + \text{HCOO}^-$
C) $\text{C}_6\text{H}_5 - \text{OH} \rightarrow \text{C}_6\text{H}_6$
D) $\begin{array}{c} \text{CH}_2 - \text{CH} - \text{CH}_2 \\ | \quad | \quad | \\ \text{OH} \quad \text{OH} \quad \text{OH} \end{array} \rightarrow \text{CH}_2 = \text{CH} - \text{CH} = \text{O}$

Column – II

- P) KHSO_4
Q) PI_3
R) OH^-

S) Zn / Δ

20. **Column – I**

- A) $\text{C}_6\text{H}_5 - \text{CHOH} - \text{CH}_3 \xrightarrow[(2) \text{H}_3\text{O}^+]{(1) \text{Cl}_2, \text{NaOH}}$
B) $\text{CH}_3 - \text{CHOH} - \text{CH}_3 \xrightarrow[(2) \text{H}_3\text{O}^+]{(1) \text{Hot alk KMnO}_4 (\text{excess})}$
C) $\text{CH}_3 - \text{CHOH} - \text{CH}_3 \xrightarrow[(2) \text{H}_3\text{O}^+]{(1) \text{Cl}_2, \text{NaOH}}$
D) $\text{C}_6\text{H}_5 - \text{CH}_2\text{OH} \xrightarrow[\text{CHCl}_3, 0^\circ\text{C}]{\text{N}_2\text{O}_4}$

Column – II

- P) $\text{C}_6\text{H}_5 - \text{CHO}$
Q) $\text{C}_6\text{H}_5 - \text{COOH}$
R) CH_3COOH
S) CHCl_3

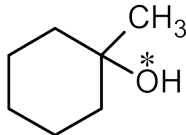
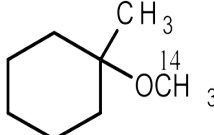
21. **Column – I**

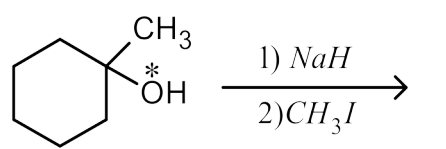
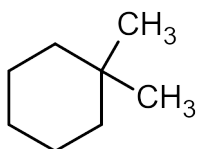
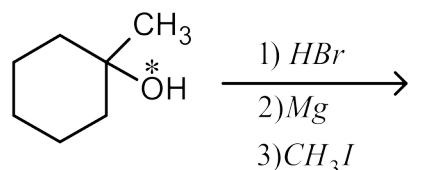
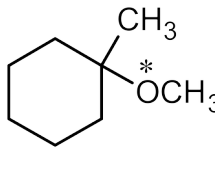
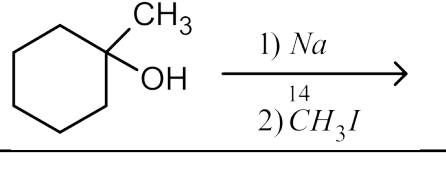
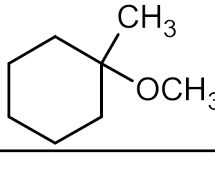
- A) $\text{CH}_3 - \text{CHOH} - \text{CH}_3 \xrightarrow{\text{R}} \text{CH}_3 - \text{CO} - \text{CH}_3$
B) $\text{CH}_2 = \text{CH} - \text{CH}_2\text{OH} \rightarrow \text{CH}_2 = \text{CH} - \text{CHO}$
C) $\text{C}_6\text{H}_5 - \text{CHOH} - \text{CH}_3 \rightarrow \text{C}_6\text{H}_5\text{CO} - \text{CH}_3$
D) $\text{C}_6\text{H}_5 - \text{CH}_2\text{OH} \rightarrow \text{C}_6\text{H}_5 - \text{CHO}$

Column – II

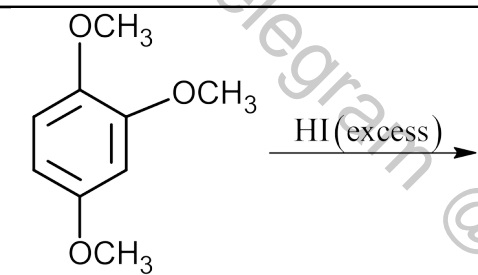
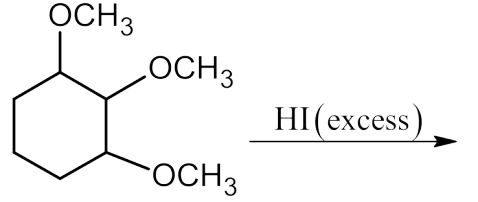
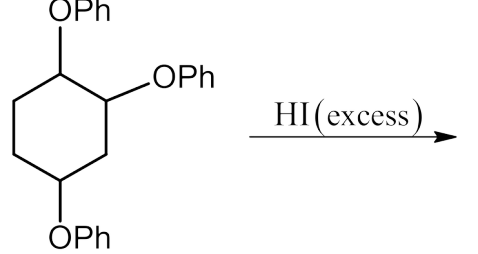
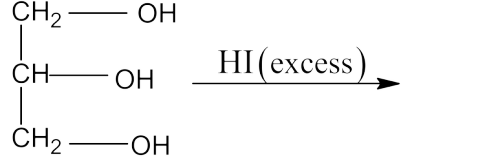
- P) CrO_3 in acetone
Q) MnO_2
R) $\text{Cu} / 300^\circ\text{C}$
S) PCC

22 Match the Following:

Column I		Column II	
(a)	 $\xrightarrow[2) \text{CH}_3\text{OH}]{1) \text{H}_2\text{SO}_4 \text{ conc.}}$	(p)	

(b)		(q)	
(c)		(r)	
(d)		(s)	

23. Match the Following:

Column I		Column II	
(a)		(p)	More than 4 moles of HI will be consumed.
(b)		(q)	Product will react with Na.
(c)		(r)	Product formed contains 2° halide.
(d)		(s)	CH ₃ I is one of the products.
		(t)	Diphenyl ketone is one of the products.

Matching Answers

1	A – Q B – R C – PS D - R	2	A - PQS B-PQRS C – PQR D - PQR	3	A –S B –R C – Q D – P	4	A – R B – P C – ST D – QT	5	A – Q B – R C – P D - Q	6	A – Q B – RT C – P D – S
7	A – QT B – P C – RS D - R	8	A – PQ B – PQ C – Q D -R	9	A-QRS B-PQRS C-QR D-PQR	10	A – Q B – P C – S D – R	11	A – Q B – PR C – ST D - S	12	A-R B-P C-ST D-QT
13	A-Q B-R C-P D-Q	14	A-Q B-RT C-P D-S	15	A-QT B-P C-RS D-R	16	A-S B-PS C-Q D-R	17	A-R B-S C-Q D-P	18	A-PQS B-RS C-QR D-PS
19	A-Q B-R C-S D-P	20	A-QS B-R C-RS D-P	21	A-PRS B-PQRS C-PQRS D-PQRS	22	A-S B-R C-Q D-P	23	A-PQS B-PQRS C-PQR D-PQR		

AEP – SOLUTIONS

Matching solutions

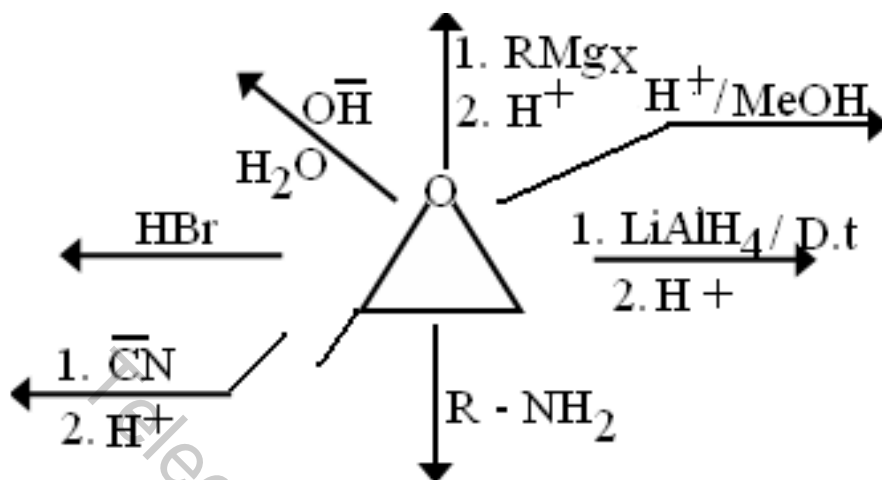
1. Conceptual
2. Conceptual

3. Ether formation & Nucleophilic substitution
4. Conceptual
5. Conceptual
6. Conceptual
7. Conceptual
8. Conceptual
9. Conceptual
10. Conceptual
11. **Pyridinium chlorochromate** (PCC), made by mixing equimolar amounts of CrO_3 , HCl and pyridine is used for oxidation of primary alcohols to aldehydes. It is soluble in CH_2Cl_2 and other organic solvents. In non-aqueous solvents the aldehyde is stable to further oxidation.
 MnO_2 : MnO_2 is a milder oxidizing agent. MnO_2 selectively oxidize the OH group of allylic and benzylic 1° or 2° alcohols to aldehydes or ketones, respectively.
Collin's reagent, a variation of PCC made up of 1 mol of CrO_3 to two mol of pyridine in CH_2Cl_2 is also used as MnO_2 .
Alkaline KMnO_4 : Oxidation of secondary alcohols to ketones and primary alcohols to acids.
Chromic acid (H_2CrO_4): Oxidation of secondary alcohols to ketones and primary alcohols to acids.
12. Conceptual
13. Conceptual
14. Conceptual
15. Conceptual
16. Conceptual
17. Conceptual
18. Conceptual
19. Conceptual
20. Oxidation reaction & haloform reactions
21. Conceptual
22. Conceptual
23. Conceptual

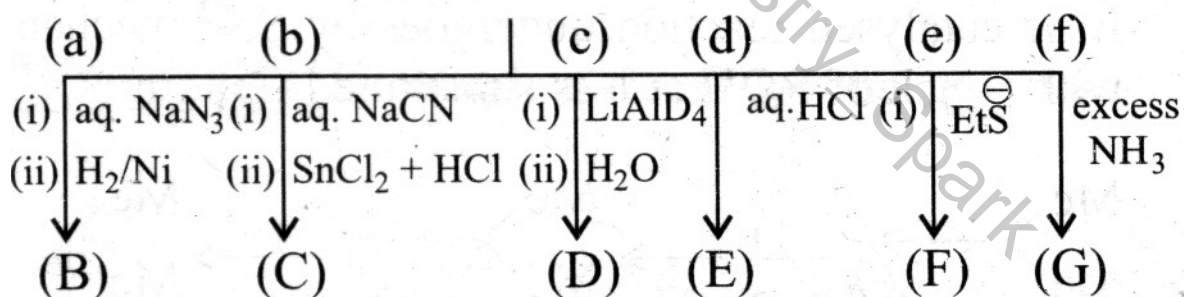
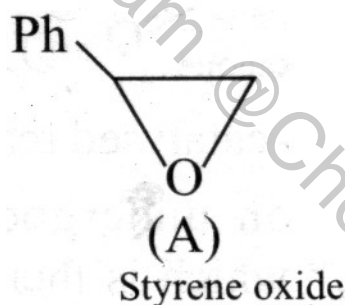
ALCOHOLS, PHENOLS, ETHERS

Integer answers type questions:

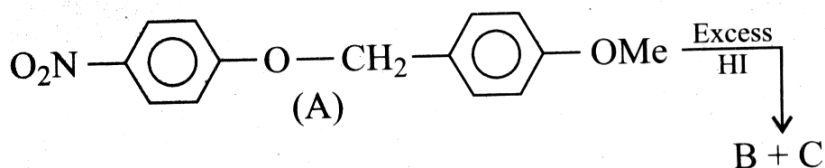
1. How many of the following epoxide cleavages are involved S_N2 type of ring opening



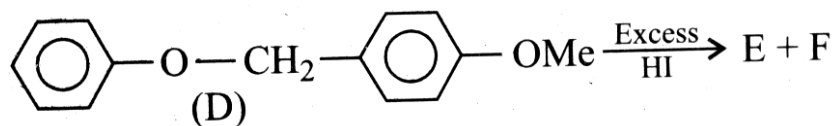
2. How many of the following reactions involved S_N2 attacks?



3. (A)

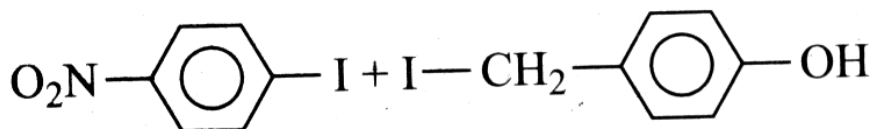


- (B)

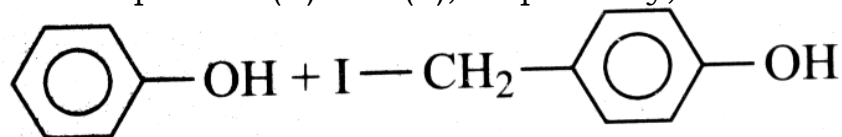


How many of the following statements is/are correct about the above reaction?

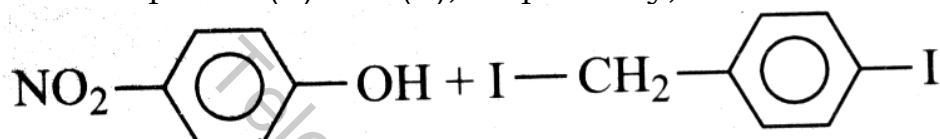
I) The compounds (B) and (C), respectively, are :



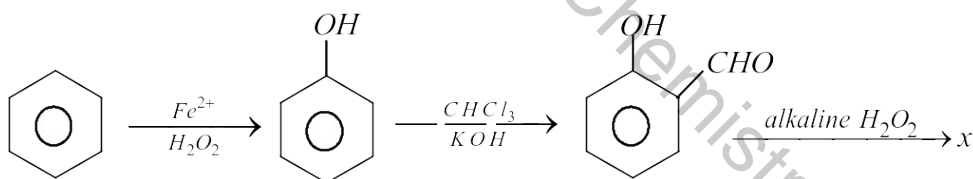
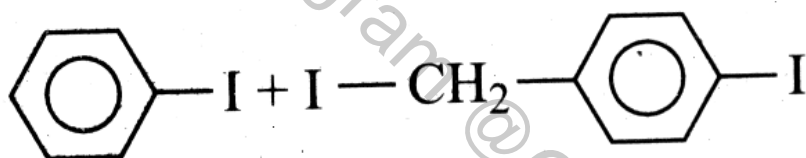
II) The compounds (E) and (F), respectively, are :



III) The compound (B) and (C), respectively, are :



IV) The compound (E) and (F), respectively, are :



4.

The number of hydroxyl groups present in the product x is/are

5. During the preparation of a yellow precipitate from one mole of ethyl alcohol in basic medium number moles of Iodine required is

6. $\text{CH}_3-\text{CH}=\text{CH}-\text{O}-\text{CH}_2-\text{CH}_3 \xrightarrow[\text{dil acid}]{} \text{X} + \text{Y}$ (positive haloform test)

The number of possible isomers for X excluding stereo isomers and including X.

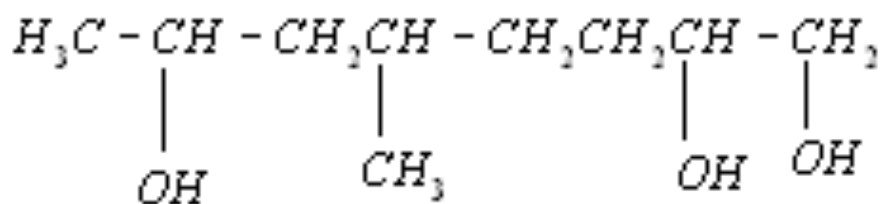
7. During the fermentation of molasses the number of moles of ethyl alcohol formed from one mole of sucrose is

8. During the conversion of Glycerol into Allyliodide number of moles of HI molecules consumed is.

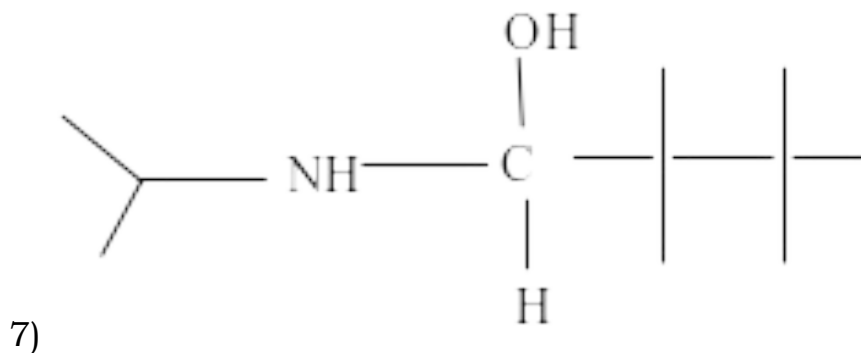
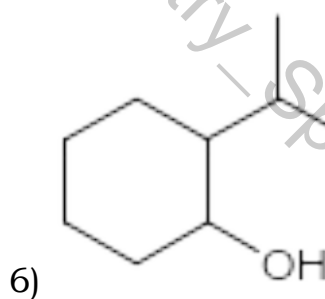
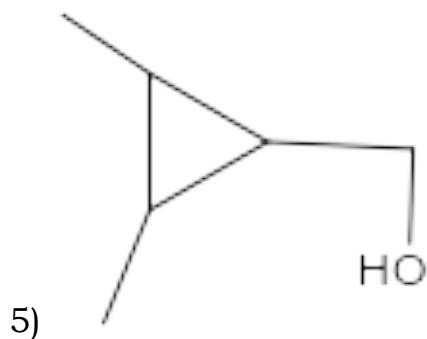
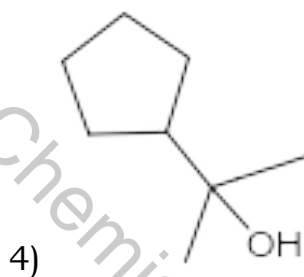
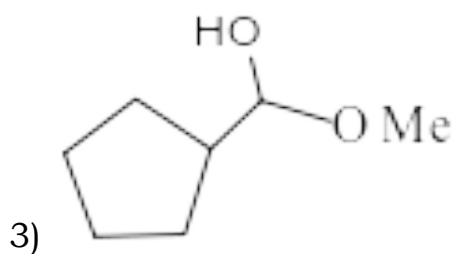
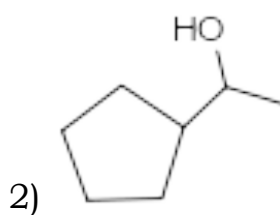
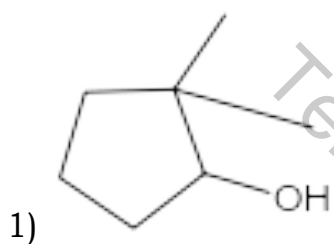
9. During the conversion of 1-butene into -1-butanol using a specific reaction how many membered transition state is formed.

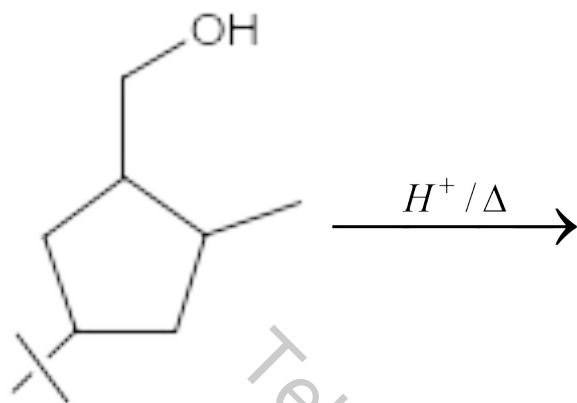
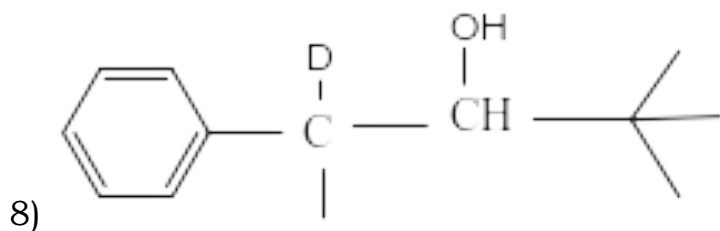
10. Number of moles of HIO_4 molecule used to oxidize one mole of glucose + number of moles of $\text{CH}_2=\text{O}$ formed during the reaction is equal to

11. What are the number of optical isomers possible for the compound



12. During the reaction of Benzene diazonium chloride with para-cresol the substitution occurs at _____ position.
13. A polyhydric alcohol of mol.wt 92, on benzylation gives a benzoyl derivative of mol.wt 404. The number of hydroxyl groups in the alcohol are
14. How many of the following alcohols undergo rearrangement on acid catalysed elimination to give alkenes.





no. of products possible in given reaction



What is the Degree of unsaturation of compound in above reaction?

17. During the preparation of a yellow precipitate from one mole of ethyl alcohol in basic medium number moles of Iodine required is

18. $\text{CH}_3 - \text{CH} = \text{CH} - \text{O} - \text{CH}_2 - \text{CH}_3 \xrightarrow{\text{dil acid}} \text{X} + \text{Y}$ (positive haloform test)

The number of possible isomers for X excluding stereo isomers and including X.

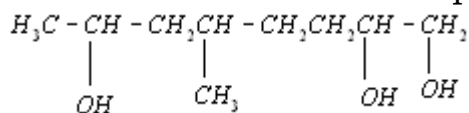
19. During the fermentation of molasses the number of moles of ethyl alcohol formed from one mole of sucrose is

20. During the conversion of Glycerol into Allyliodide number of moles of HI molecules consumed is.

21. During the conversion of 1-butene into -1-butanol using a specific reaction how many membered transition state is formed.

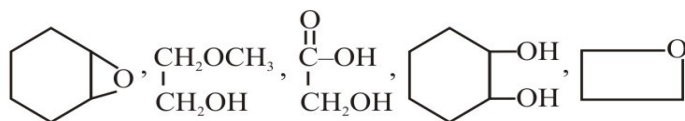
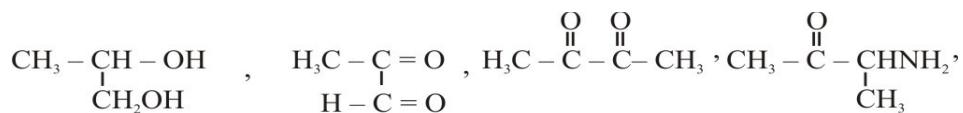
22. Number of moles of HIO_4 molecule used to oxidize one mole of glucose + number of moles of $\text{CH}_2 = \text{O}$ formed during the reaction is equal to

23. What are the number of optical isomers possible for the compound

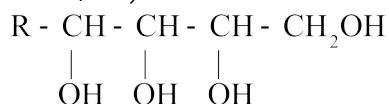


24. During the reaction of Benzene diazonium chloride with para-cresol the substitution occurs at _____ position.

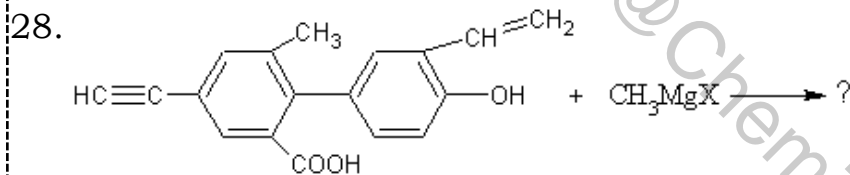
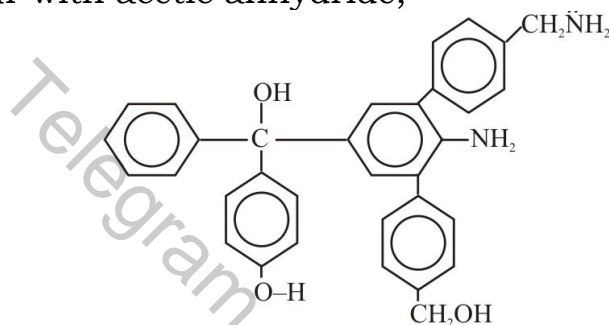
25. How many among compounds are not oxidized by HIO_4 ,



26. How many moles of HCOOH is formed, due to the oxidation with HIO_4 of,

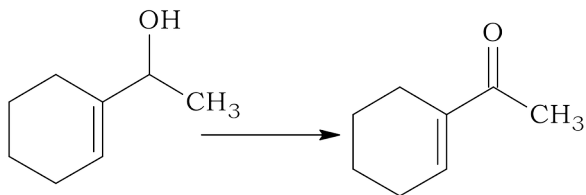


27. Identify the number of positions, in compound where acetylation reaction occur with acetic anhydride,



How many mole alkane will be formed ?

29. The number of reagents among the following which effect the given conversion is



(i) PCC

(ii) PDC

(iii) $\text{K}_2\text{Cr}_2\text{O}_7/\text{Con. H}_2\text{SO}_4$

(iv) Br_2/NaOH

(v) Alkaline KMnO_4

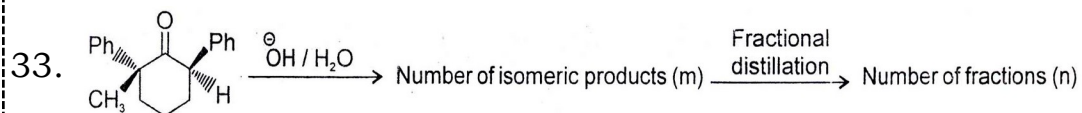
(vi) $\text{Cu}, 573 \text{ K}$

(vii) $\text{AgNO}_3/\text{NH}_3$

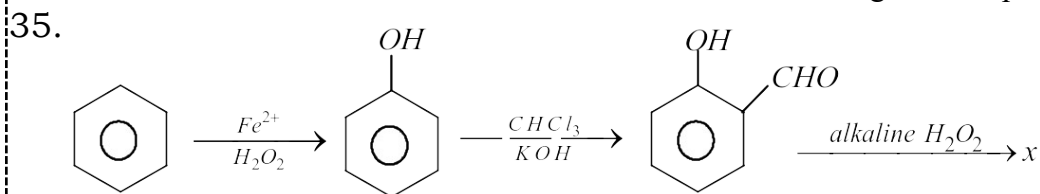
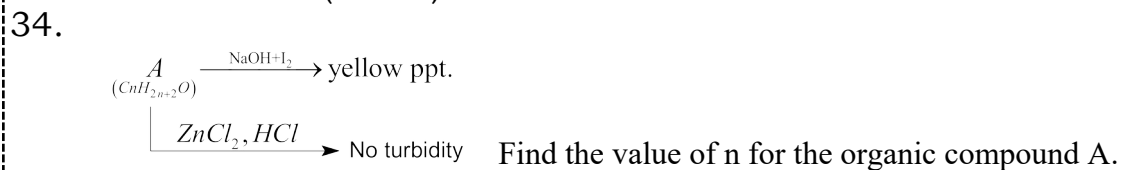
(viii) NaBH_4

(ix) LiAlH_4

30. The number of unshared pair of electrons in the electrophile involved in conversion of phenol to salicylaldehyde using CHCl_3/KOH is
31. A Compound 'A' with formula $\text{C}_4\text{H}_{10}\text{O}_3$ on acylation with acetic anhydride gives another compound 'B' with molecular mass 190. The number of hydroxyl group in the compound A are
32. 1, 2, 3 propanetriol on heating with KHSO_4 followed by heating with $(\text{C}_2\text{H}_5\text{O})_3\text{Al}$ gave a compound X number of π electrons in that compound is.



The value of (m + n) is



The number of hydroxyl groups present in the product x is/are

AEP – KEY SHEET

Integer Answers

1	7	2	5	3	2	4	2	5	4	6	8
7	4	8	3	9	4	10	6	11	8	12	2
13	3	14	6	15	5	16	4	17	4	18	8
19	4	20	3	21	4	22	6	23	8	24	2
25	2	26	2	27	3	28	3	29	3	30	7
31	2	32	6	33	4	34	2	35	2		

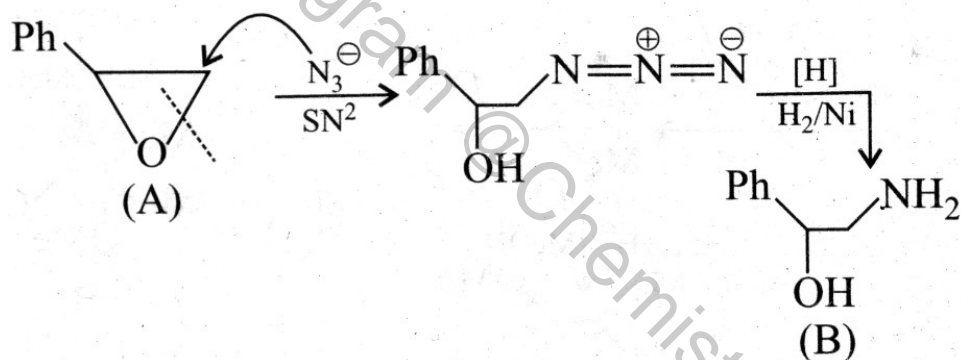
AEP – SOLUTIONS

Integer solutions

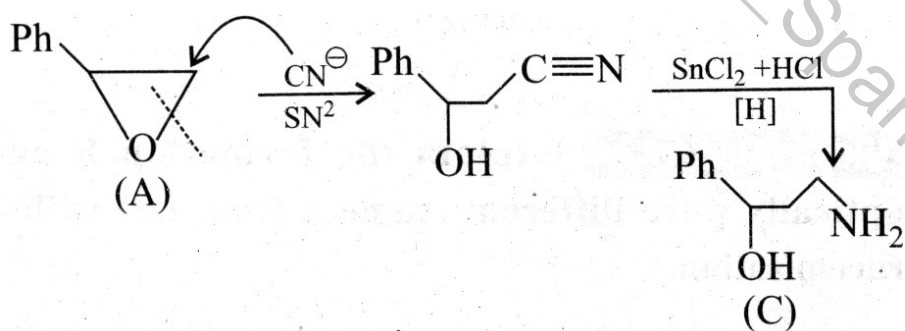
1. All the cleavages of propene oxide are the S_N2 type, irrespective of the medium. Even in acidic medium cleavage is S_N2 type. This is due to the fact that transition state of ring opening in acidic medium cleavage is not possessing sufficient carbocationic character. If there were sufficient carbocationic character in the T.S of ring opening in acidic medium, then the mechanistic path would have been mixed i.e. $S_N2 + S_N1$ [S_N1 product would have been possible]. In fact ring opening phenomena of propene oxide in acidic medium is in reversal of what we have expected. So in the given list all reactions are showing S_N2 mode of ring opening, which means least sterically hindered carbon must be selected.

2.

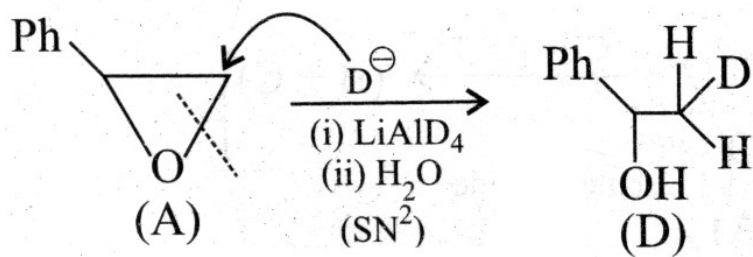
A)



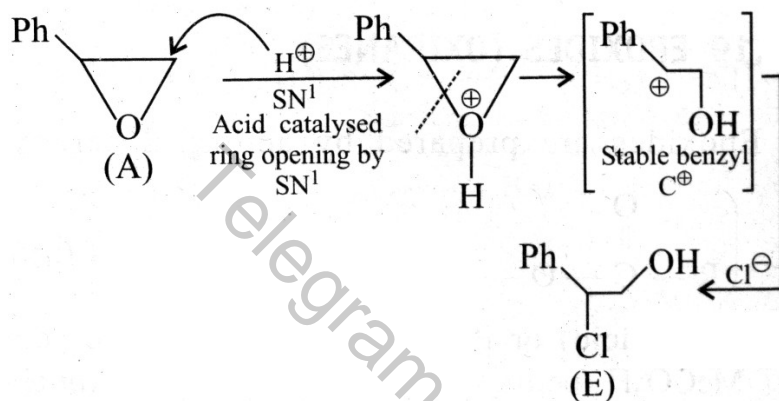
B)



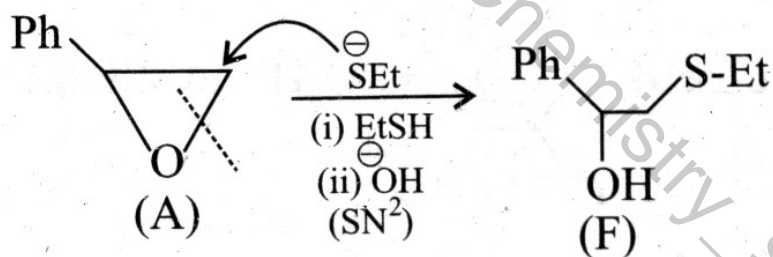
C)



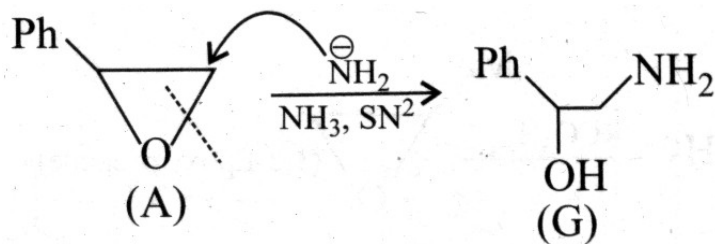
D)

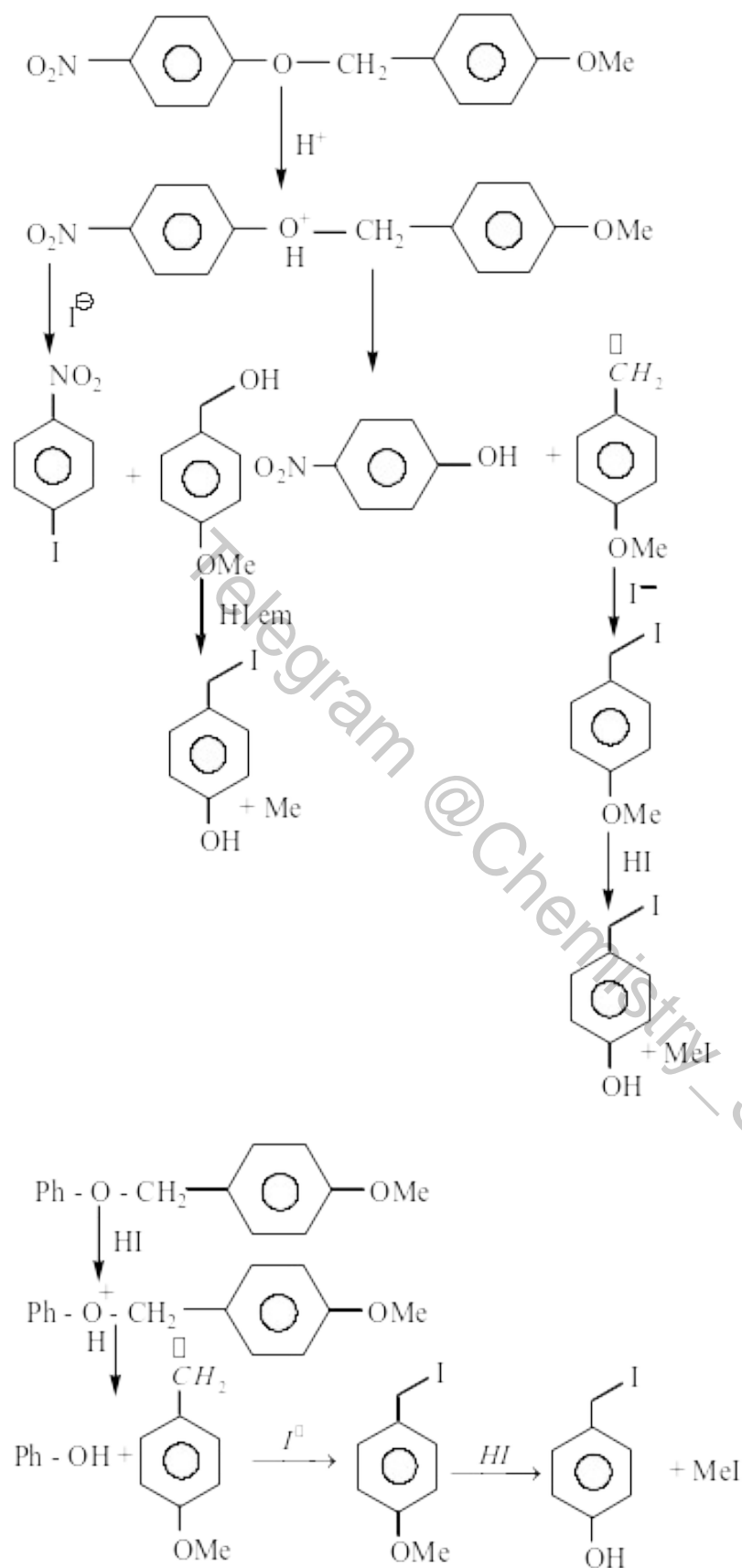


E)



F)

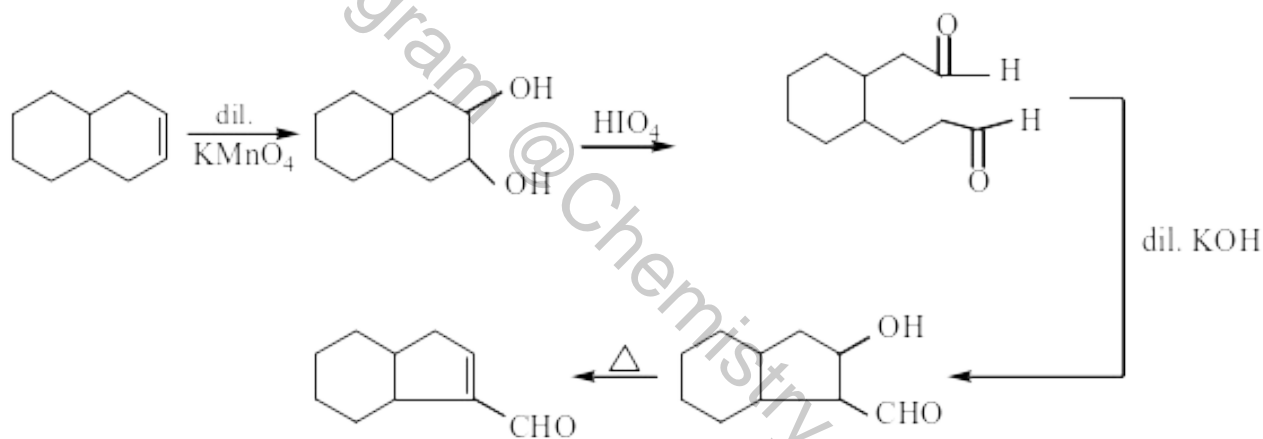




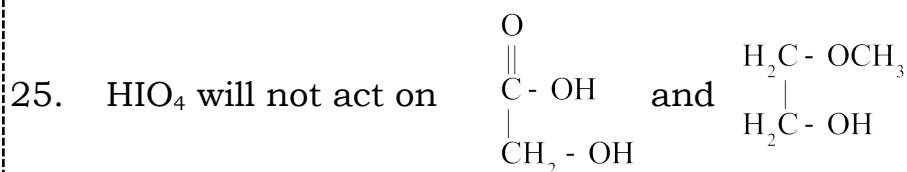
4. X is catechol

5. Conceptual

6. Conceptual
7. Conceptual
8. Conceptual
9. Conceptual
10. Conceptual
11. Conceptual
12. Conceptual
13. Conceptual
14. Conceptual
15. Conceptual
- 16.



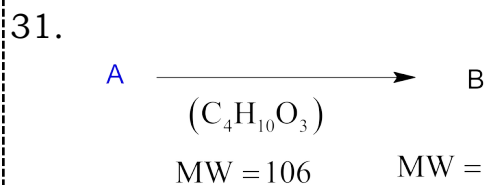
17. Conceptual
18. X is propenol
19. Conceptual
20. Conceptual
21. During HBO 4 members TS is formed
22. Conceptual
23. It has 3 chiral centers without any symmetry $2^3=8$
24. Conceptual



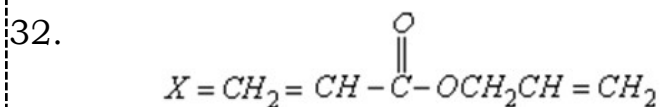
26. Conceptual
27. Conceptual
28. Because the compound have 3 acidic H. hence 3 CH_4 will be formed.
29. 3

(i) PCC (ii) PDC (vi) Cu, 573 K

30. 7
The electrophile is :CCl_2 which has 1 lp on carbon and 3 lp on each Cl.



$$\therefore \text{No of } -\text{OH group} = \frac{190 - 106}{42} = 2$$



Hence no of $\pi e^- = 6$

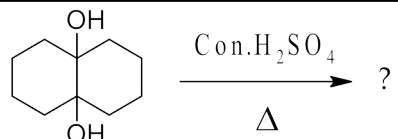
33. 4
Pair of diastereomers is formed (m), therefore, two fractions are obtained.

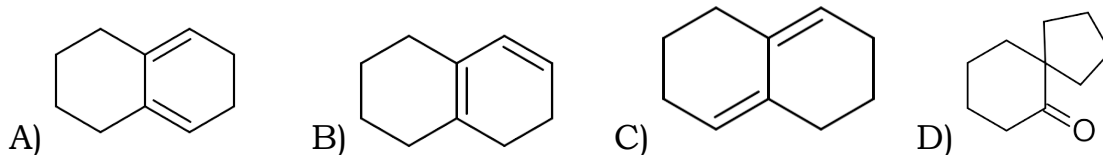
34. 2


35. X is catechol

ALCOHOLS, PHENOLS, ETHERS

One or more than one answer type questions:

1.  The possible product(s) in the above reaction is/are:

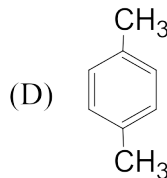
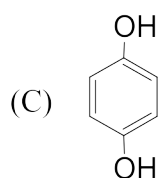
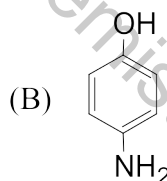
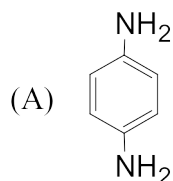
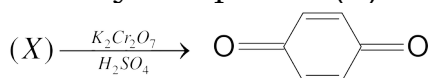


2.  Product

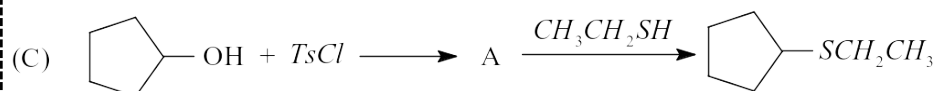
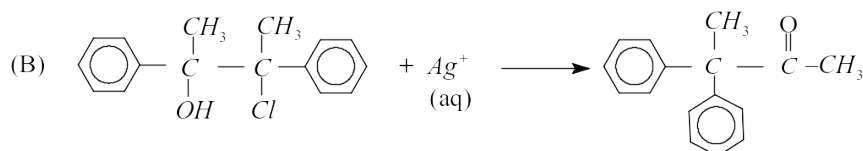
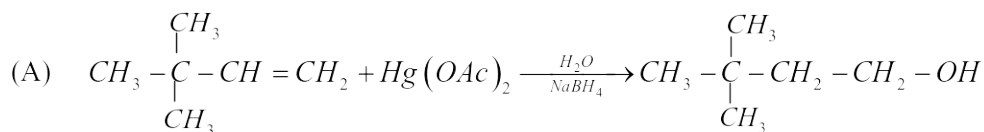
Which of the following are possible product(s) (in the significant amounts)?

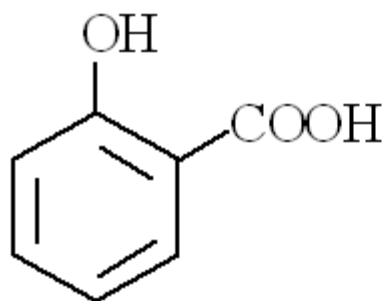
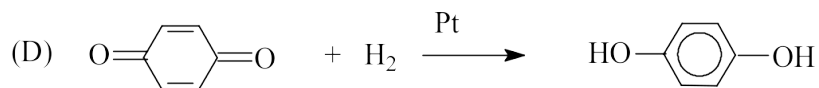


3. Identify compound (X) in the following oxidation reaction :



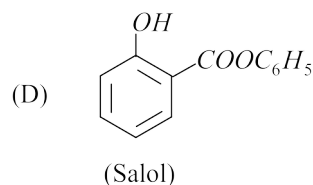
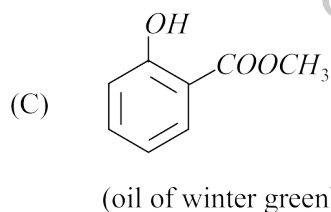
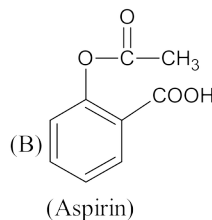
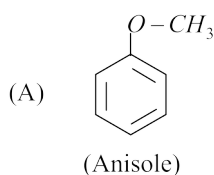
4. Which of the following reactions are correctly interpreted?





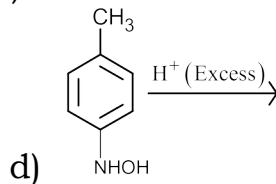
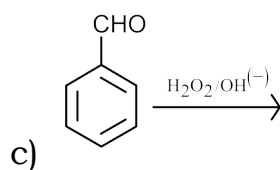
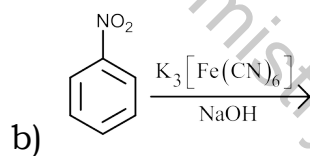
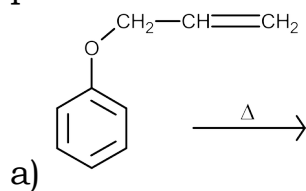
is used to get

5.

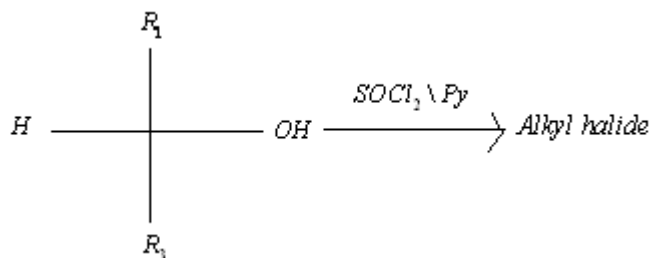


6.

In which of the following reactions, a phenolic compound is formed as product ?



7.

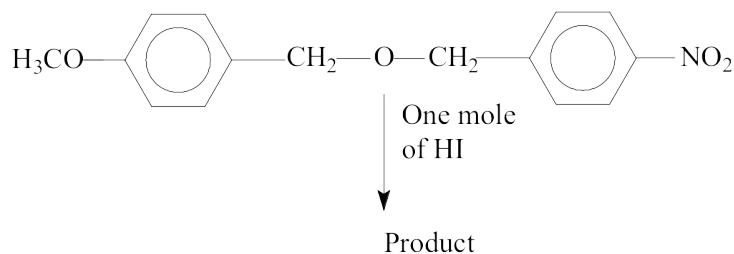


Which of the following statement is correct regarding above reaction

a) The reaction mechanism involves initial formation of alkyl chlorosulfite

- b) Cl^- (from $\text{C}_6\text{H}_5\text{N}^+\text{HCl}^-$) can bring $\text{S}_{\text{N}}1$ displacement of very good leaving group ClSO_2^-
- c) overall 100% retention takes place during the reaction
- d) overall 50% retention and 50% Inversion takes place during the reaction.

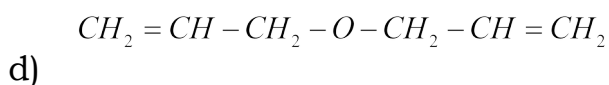
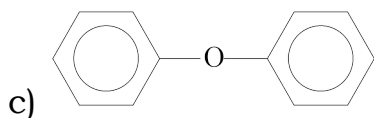
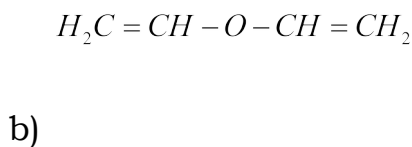
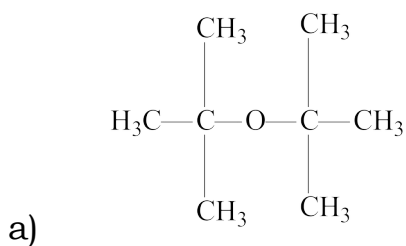
8.



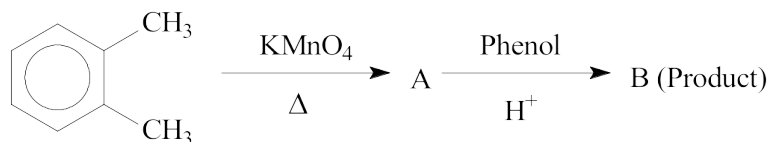
Products are

a)	$\text{H}_3\text{CO}-\text{C}_6\text{H}_4-\text{CH}_2\text{I}$	b)	$\text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{CH}_2\text{I}$
c)	$\text{H}_3\text{CO}-\text{C}_6\text{H}_4-\text{CH}_2\text{OH}$	d)	$\text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{CH}_2\text{OH}$

9. Which of the following ether cannot be prepared by using Williamson's synthesis

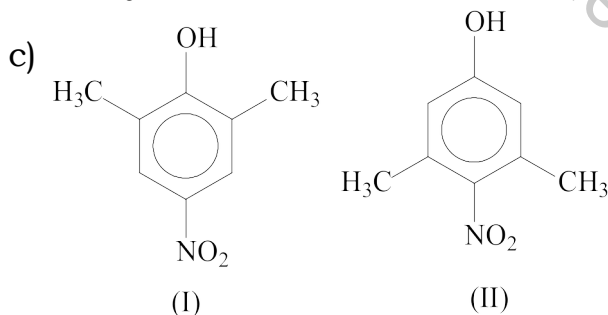


10.



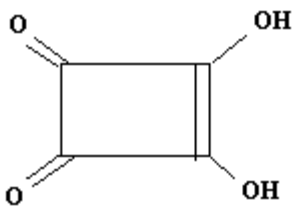
Which of the following is correct regarding product 'B'

- 'B' is colourless in acidic medium
 - 'B' is pink colour in basic medium
 - 'B' has Benzenoid form in Basic medium
 - 'B' exists in Ionic form in Basic medium
11. Which of the following reactions is used to prepare phenolic compound
- Dakin's reaction
 - Hydrolysis of phenolic ethers in acidic medium
 - Reduction of aromatic aldehydes
 - Reaction of phenyl acetate with AlCl_3 at 165°C
12. Which of the following statement(s) is/are correct
- Dehydration of alcohols will take place rapidly with POCl_3 than with H_2SO_4
 - Hydroboration oxidation of 3,3-dimethyl -1 Butene produces 3,3-dimethyl-2-Butanol



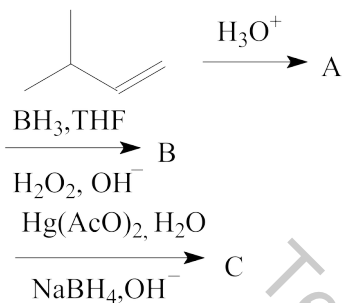
Among I and II I is more acidic than II

- Anti conformer of glycol is more stable than its gauche conformer
13. Which of the following statements are correct
- Phenol on treating with $\text{K}_2\text{S}_2\text{O}_8 / \text{OH}^-$ produces quinol
 - Phenol on treating with $\text{CH}_3\text{COCl} / \text{AlCl}_3$ produces para hydroxy acetophenone
 - Acylation of salicylic acid in basic medium occurs on phenolic oxygen
 -



gives effervescence with NaHCO_3

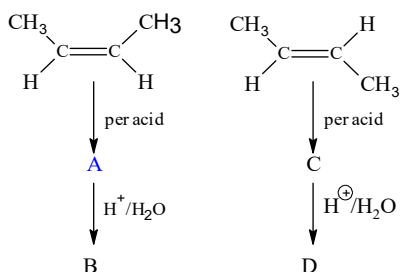
14.



Which of the statements given is / are not correct

- 'C' is primary alcohol
- 'B' form turbidity with lucas reagent after 5-10 minutes and gives yellow ppt with aqueous bleaching powder
- 'A' is tertiary alcohol and gives Red ppt during victor mayer reaction ($\text{PI}_3, \text{AgNO}_2, \text{HNO}_2, \text{Base}$)
- Both 'B' and 'C' are 2° alcohols respond to haloform reaction

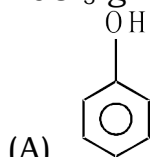
15.



Which of the following statements is/are true:

- B is a single compound and optically inactive
- D is a single compound and optically inactive
- B is an equimolar mixture of two enantiomeric compounds
- D is an equimolar mixture of two enantiomeric compounds

16. FeCl_3 gives positive test with



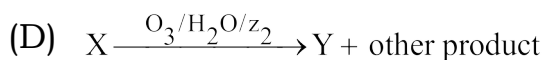
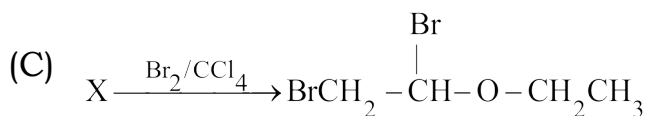
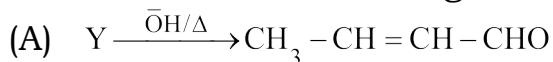
(A)

(C) acetoacetic ester

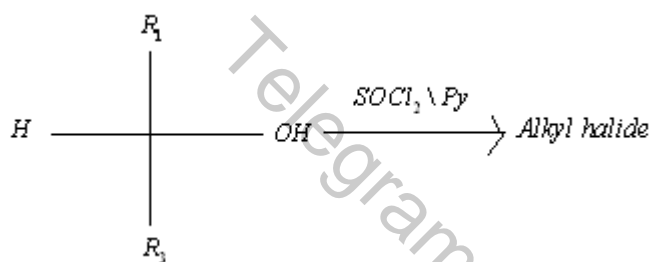
(B) acetylacetone

(D) acrolein

17. Compound (X) C_4H_8O decolorizes Baeyer's reagent. It undergoes hydrolysis in dil H_2SO_4 to give (Y) and (Z) where both Y and Z give positive iodoform test while only 'Y' responds to Tollens test but (Z) doesn't. Choose the correct statements of the following :



18.



Which of the following statement is correct regarding above reaction

a) The reaction mechanism involves initial formation of alkyl chlorosulfite

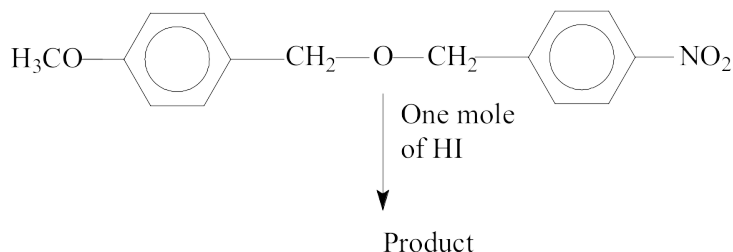
b)

Cl^- (from $C_6H_5N^+HCl^-$) can bring SN^i displacement of very good leaving group $ClSO_2$

c) overall 100% retention takes place during the reaction

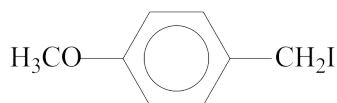
d) overall 50% retention and 50% Inversion takes place during the reaction.

19.

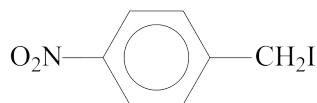


Products are

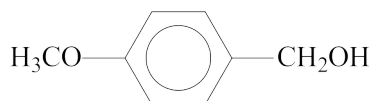
a)



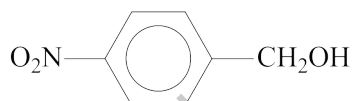
b)



c)

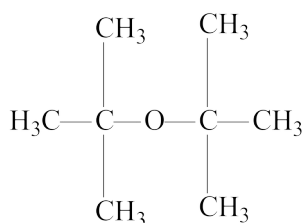


d)



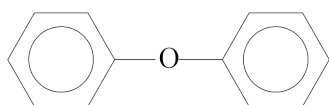
20. Which of the following ether cannot be prepared by using Williamson's synthesis

a)



b) $H_2C = CH - O - CH = CH_2$

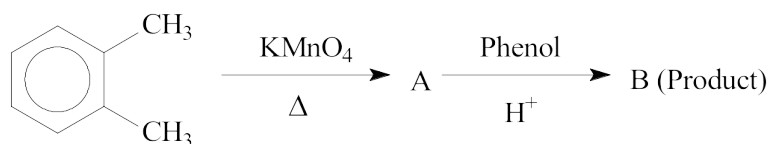
c)



d)

$CH_2 = CH - CH_2 - O - CH_2 - CH = CH_2$

21.



Which of the following is correct regarding product 'B'

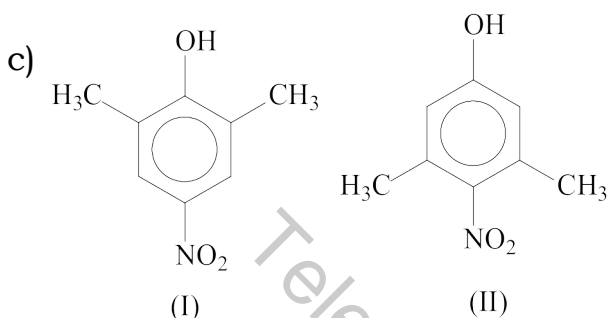
a) 'B' is colourless in acidic medium

b) 'B' is pink colour in basic medium

c) 'B' has Benzenoid form in Basic medium

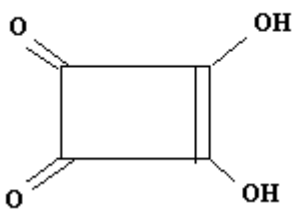
d) 'B' exists in Ionic form in Basic medium

22. Which of the following reactions is used to prepare phenolic compound
- Dakin's reaction
 - Hydrolysis of phenolic ethers in acidic medium
 - Reduction of aromatic aldehydes
 - Reaction of phenyl acetate with AlCl_3 at 165°C
23. Which of the following statement(s) is/are correct
- Dehydration of alcohols will take place rapidly with POCl_3 than with H_2SO_4
 - Hydroboration oxidation of 3,3-dimethyl-1 Butene produces 3,3-dimethyl-2-Butanol

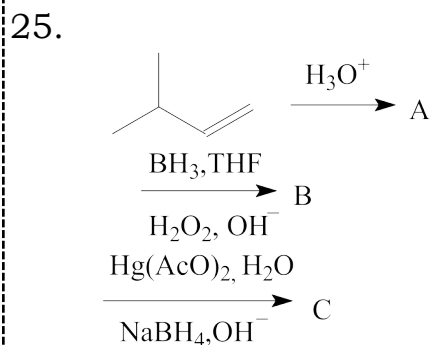


Among I and II I is more acidic than II

- d) Anti conformer of glycol is more stable than its gauche conformer
24. Which of the following statements are correct
- Phenol on treating with $\text{K}_2\text{S}_2\text{O}_8 / \text{OH}^-$ produces quinol
 - Phenol on treating with $\text{CH}_3\text{COCl} / \text{AlCl}_3$ produces para hydroxyl acetophenone
 - Acylation of salicylic acid in basic medium occurs on phenolic oxygen
 -



gives effervescence with NaHCO_3



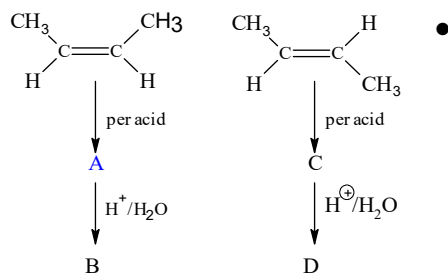
Which of the statements given is / are not correct

- 'C' is primary alcohol
- 'B' form turbidity with Lucas reagent after 5-10 minutes and gives yellow ppt with aqueous bleaching powder

c) 'A' is tertiary alcohol and gives Red ppt during victor mayer reaction ($PI_3, AgNO_2, HNO_2, Base$)

d) Both 'B' and 'C' are 2° alcohols respond to haloform reaction

26.



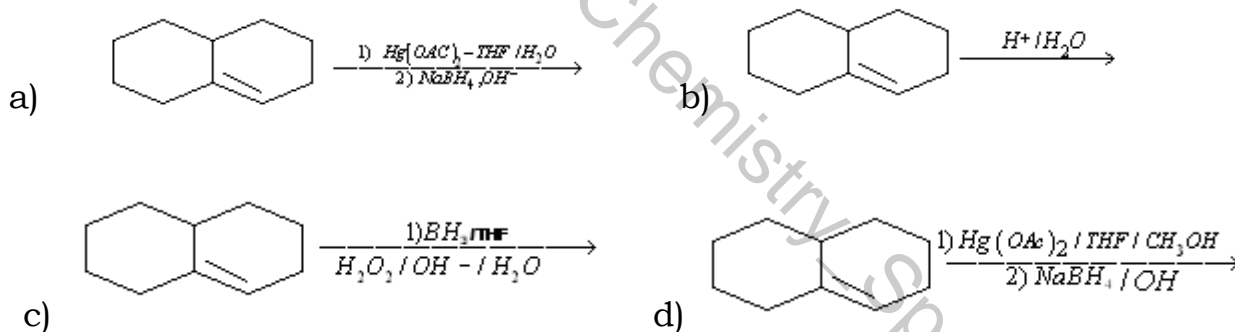
Which of the following statements is/are true:

- a) B is a single compound and optically inactive
- b) D is a single compound and optically inactive
- c) B is an equimolar mixture of two enantiomeric compounds
- d) D is an equimolar mixture of two enantiomeric compounds

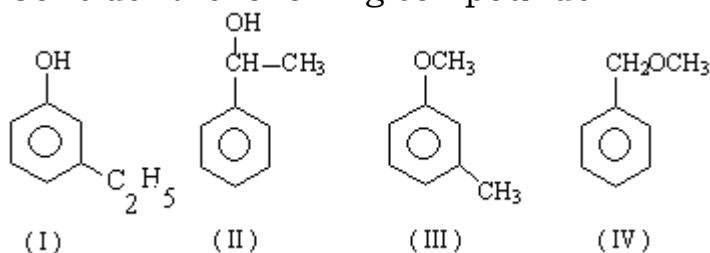
27. The reagent (s) used to convert phenol in to Anisole is/are.

- a) $NaOH, CH_3I$
- b) CH_2N_2, BF_3
- c) $(CH_3)_2SO_4, NaOH$
- d) $NaHCO_3, CH_3I$

28. Predict which two reactions give the same alcohol among the following reactions:



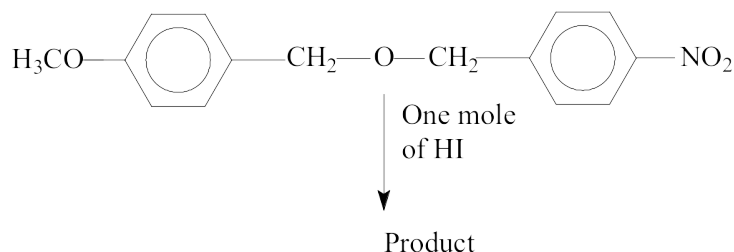
29. Consider the following compounds



Choose the correct statement(s) from the following

- A) I, II and III are functional isomers
- B) I and II are position isomers
- C) III and IV are chain isomers
- D) III and IV are metamers

30.



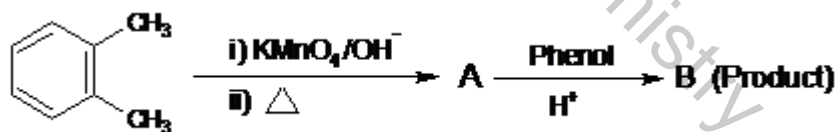
major products are

- (A) $\text{H}_3\text{CO}-\text{C}_6\text{H}_4-\text{CH}_2\text{I}$ (B) $\text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{CH}_2\text{I}$
 (C) $\text{H}_3\text{CO}-\text{C}_6\text{H}_4-\text{CH}_2\text{OH}$ (D) $\text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{CH}_2\text{OH}$

31. Which of the following ether cannot be prepared in appropriate amount by using Williamson's synthesis

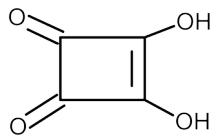
- (A) $\text{H}_3\text{C}-\text{C}(\text{CH}_3)_2-\text{O}-\text{C}(\text{CH}_3)_2-\text{CH}_3$ (B) $\text{H}_2\text{C}=\text{CH}-\text{O}-\text{CH}=\text{CH}_2$
 (C) $\text{C}_6\text{H}_5-\text{O}-\text{C}_6\text{H}_5$ (D) $\text{CH}_2=\text{CH}-\text{CH}_2-\text{O}-\text{CH}_2-\text{CH}=\text{CH}_2$

32.



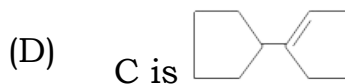
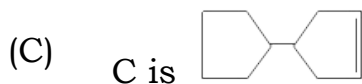
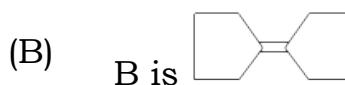
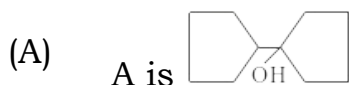
Which of the following is correct regarding product 'B'

- (A) 'B' is colourless in acidic medium (B) 'B' is pink colour in basic medium
 (C) 'B' has Benzenoid form in Basic medium (D) 'B' exists in Ionic form in Basic medium
33. Which of the following statements are correct
- (A) Phenol on treating with $\text{K}_2\text{S}_2\text{O}_8/\text{OH}^-$ produces quinol
 (B) Phenol on treating with $\text{CH}_3-\text{C}(=\text{O})-\text{Cl}/\text{AlCl}_3$ produces para hydroxy acetophenone
 (C) Acylation of salicylic acid in basic medium occurs on phenolic oxygen
 (D) $\text{C}_6\text{H}_2(\text{OH})_4$ gives effervescence with NaHCO_3

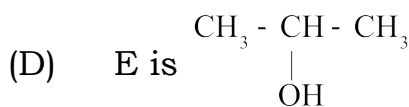
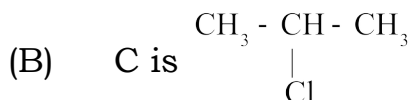


34. Alcohol A ($\text{C}_{10}\text{H}_{18}\text{O}$) is converted to mixture of alkene B and C on heating with conc. H_3PO_4 . Catalytic hydrogenation of B and C yields the same

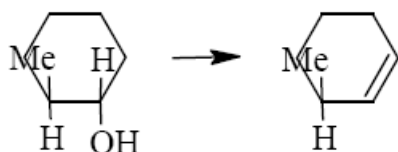
product. Assume that dehydration of alcohol A proceeds without rearrangement. Alkene B on ozonolysis forms cyclopentanone. Identify the correct option.



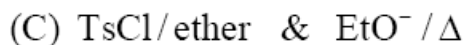
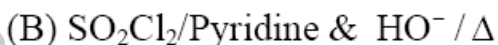
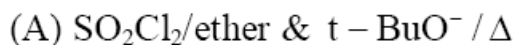
35. A ($C_5H_{12}O$) ether, on reaction with PCl_5 form alkyl chloride B and C. B and C both on reaction with aqueous KOH form alcohol D and E. Both D and E give iodoform test. Identify correct answers.



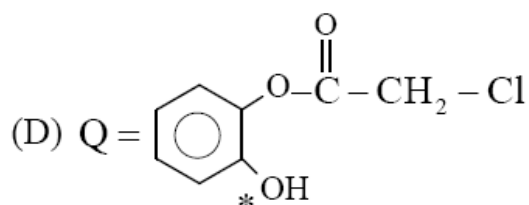
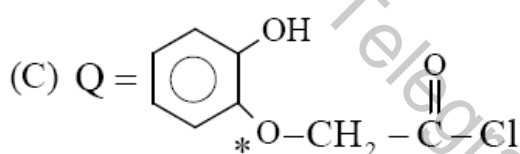
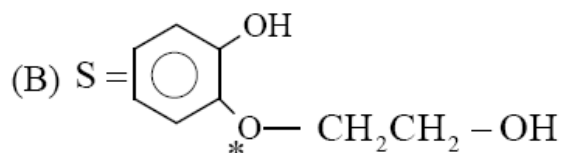
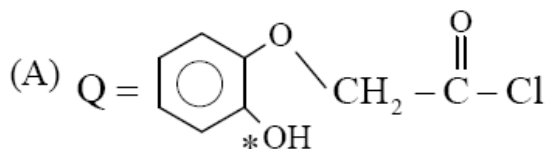
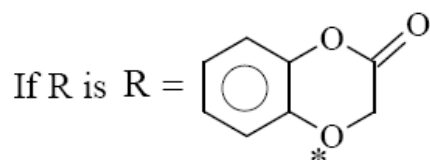
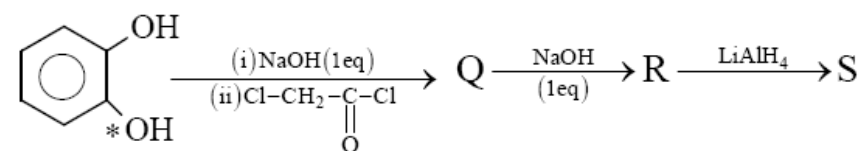
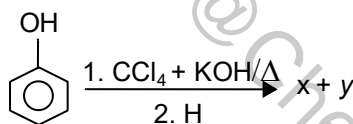
36.



Which of the following conditions represent to perform above reaction?



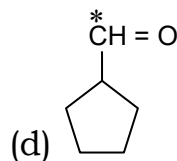
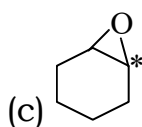
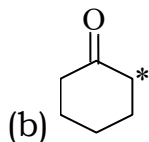
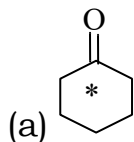
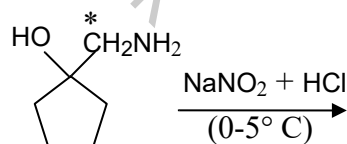
37.

38. Compare the properties of two isomeric products x and y formed in the

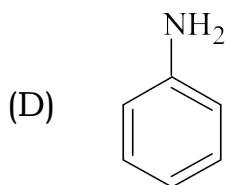
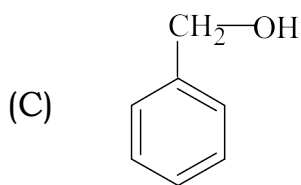
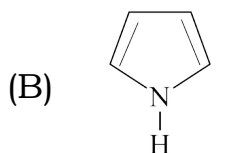
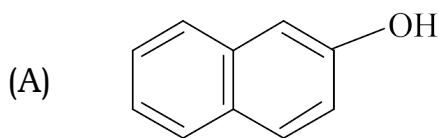
Following reaction.

	Acid strength	H ₂ O solubility	Volatility	M. point
(a)	$y > x$	$y > x$	$x \geq y$	$y \geq x$
(b)	$x > y$	$x > y$	$y > x$	$x > y$
(c)	$y > x$	$x > y$	$y > x$	$y > x$
(d)	$x > y$	$y > x$	$x > y$	$y > x$

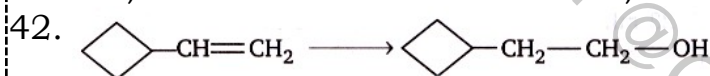
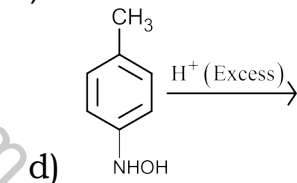
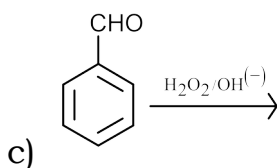
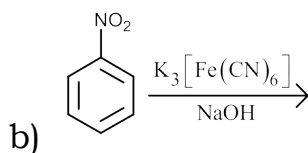
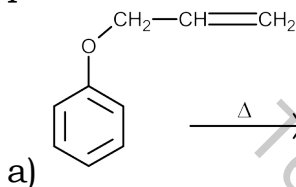
39. The product P (major) of the following reaction is



40. Which of the following compounds undergoes Reimer-Tiemann reaction ?

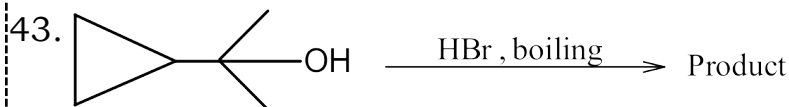


41. In which of the following reactions, a phenolic compound is formed as product ?

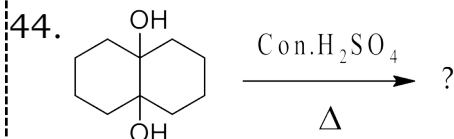
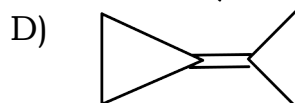
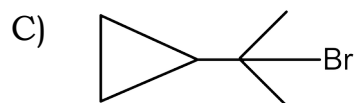
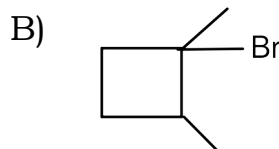
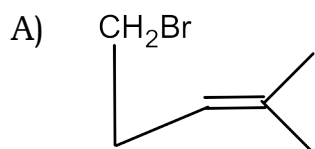


The conversion can be performed suitably by

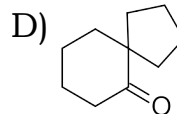
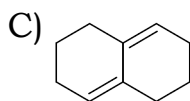
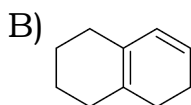
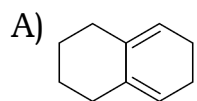
- A) I. BH_3 - THF II. H_2O_2, OH^-
 B) I. HBr peroxide II. OH^-
 C) I. Cl_2, H_2O II. $LiAlH_4$
 D) I. HBr II. OH^-



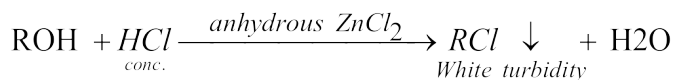
Which of the following are possible product(s) (in the significant amounts)?



The possible product(s) in the above reaction is/are:



45. Luca's test is used to make distinction between 1, 2 and 3 alcohols



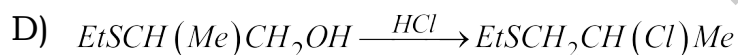
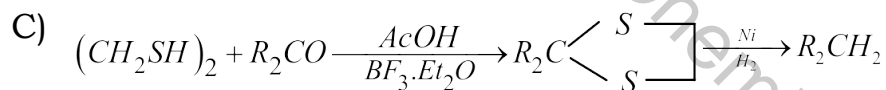
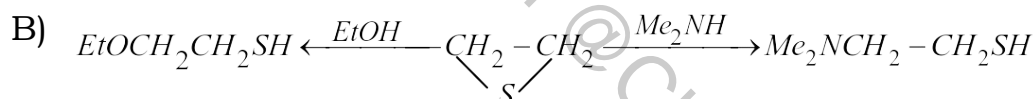
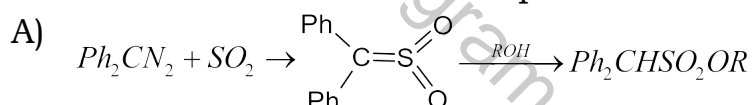
A) ROH behaves as a Lewis base

B) Greater the value of pK_a (alcohol), greater the reactivity with conc. HCl and thus faster the formation of white turbidity.

C) Alcohol which readily reacts with Na metal, will give turbidity readily

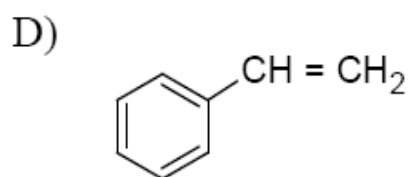
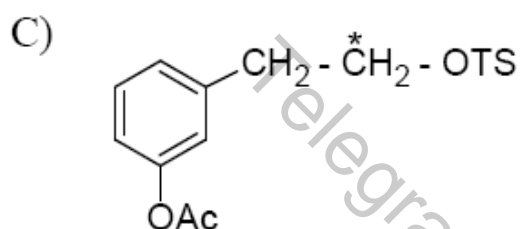
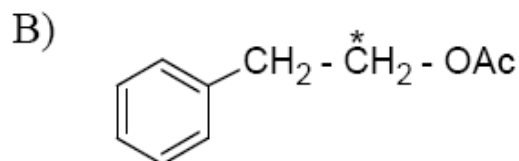
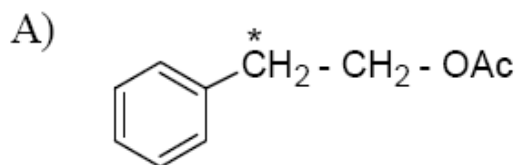
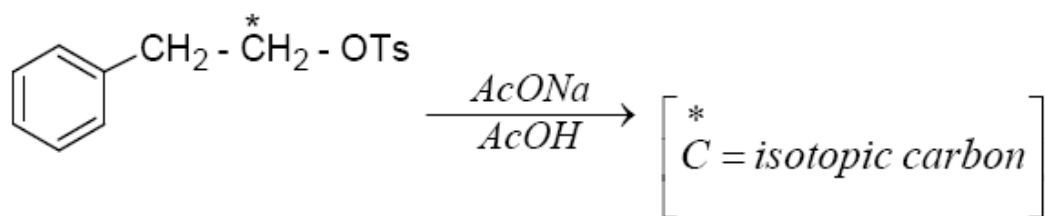
D) Alcohol which gives red colour in Victor Meyer test, will give turbidity at slower rate than those giving blue or white colour in Victor Meyer test.

46. Which of the following represent the correct sequence of completing the reactions with suitable products?



47.

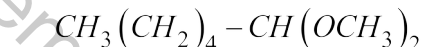
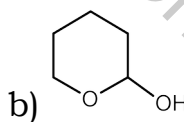
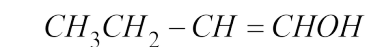
Product (s) formed during this reaction are



48. Which of the following statements are correct ?

A) 1,2-; 1,3-; 1,4-dioxanes are used as solvents in reactions involving Gignard reagent

B) Consider

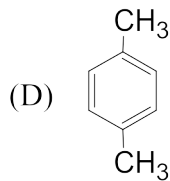
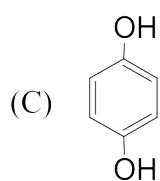
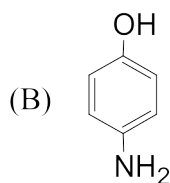
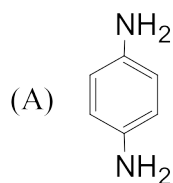
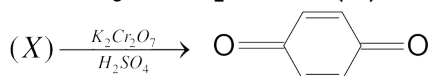


All (ie, a,b,c) give a + ve Tollens test

C) Cyanoacetic acid is stronger than fluoroacetic acid

D) One mole of ethyl orthoformate gives three moles of ethyl alcohol on hydrolysis

49. Identify compound (X) in the following oxidation reaction :



AEP – KEY SHEET

One or more than one Answers

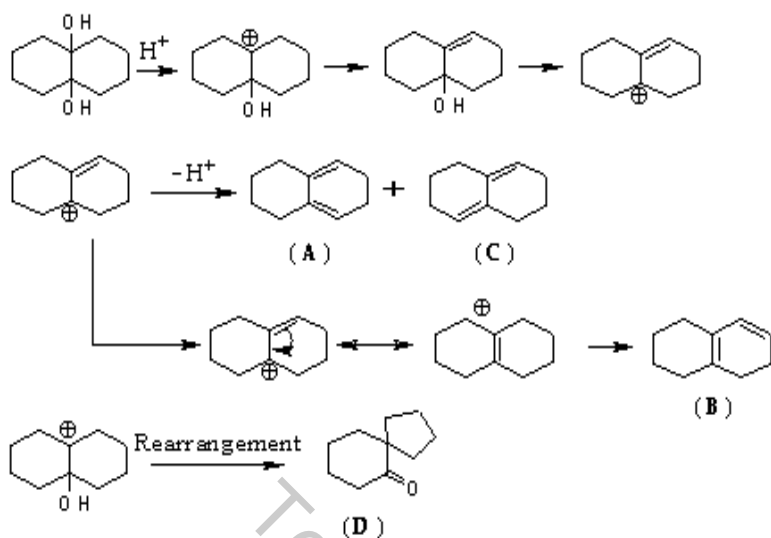
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7	A	8	AD	9	ABC	10	ABD	11	ABD	12	AC
13	ACD	14	ABCD	15	BC	16	ABC	17	ABC	18	A
19	AD	20	ABC	21	ABD	22	ABD	23	AC	24	ACD
25	ABCD	26	BC	27	ABC	28	AB	29	AD	30	AD
31	ABC	32	ABD	33	ACD	34	ABD	35	ABD	36	AC
37	BCD	38	D	39	B	40	AB	41	ABCD	42	AB
43	BCD	44	ABCD	45	ABD	46	ABCD	47	AB	48	CD
49	ABC										

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AEP – SOLUTIONS

One or more than one solutions

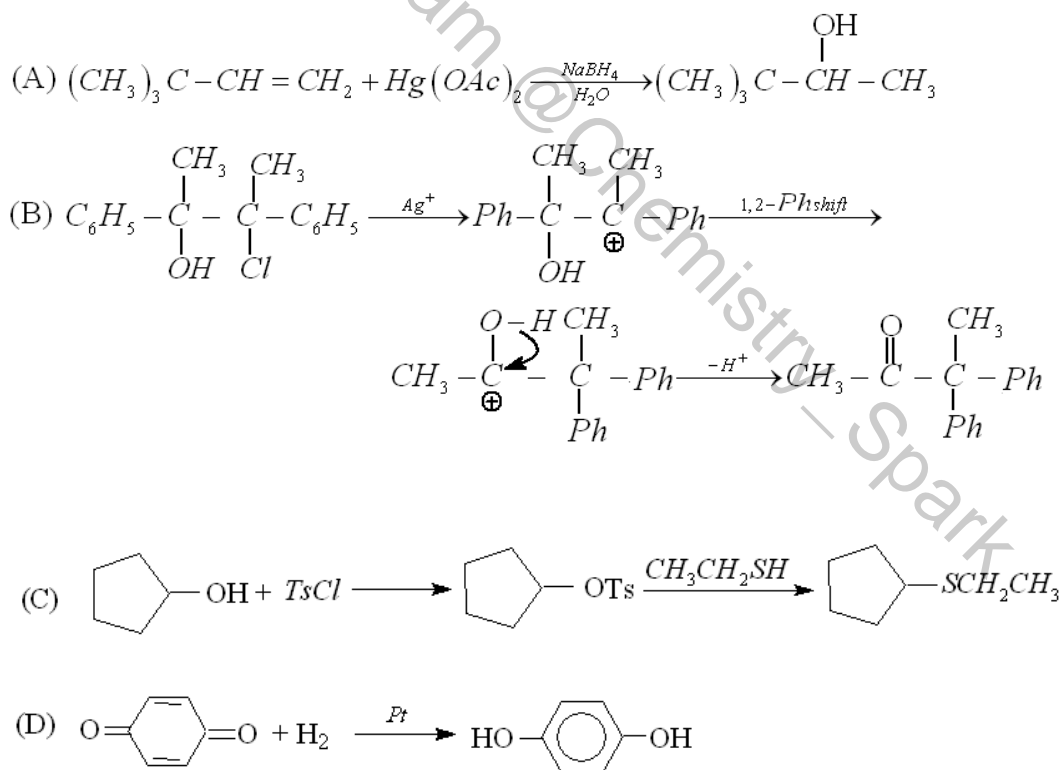
1.



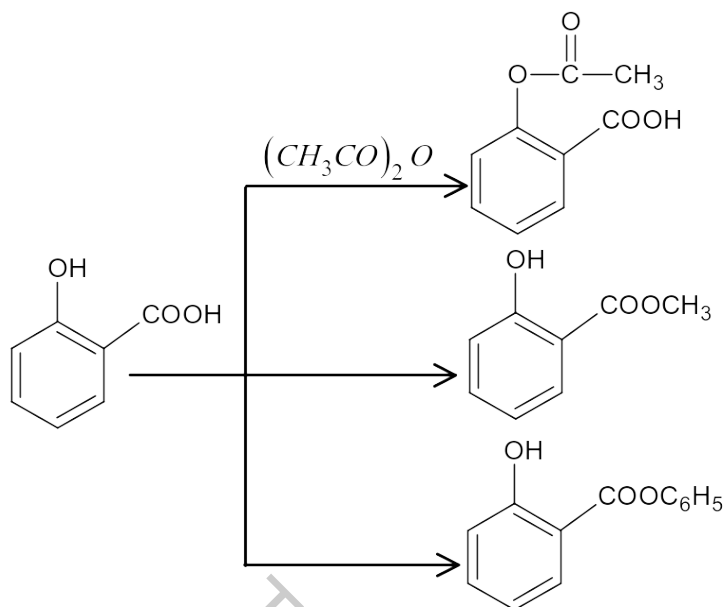
2. Nucleophilic substitution.

3. ABC

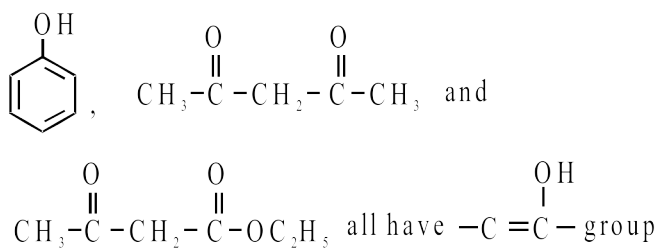
4.



5.



6. a) Claisen rearrangement b) nitrophenol is formed
c) Dakin's reaction d) amino phenol is formed
7. S_N^2 reaction
8. due more stable carbo cation
9. Conceptual
10. product is phenophthalein
11. reduction of aromatic aldehydes produces aromatic alcohols
12. in compound II steric repulsions exists
13. In gauche conformer hydrogen bond is present
Squaric acid is a strong dibasic acid
14. hydration leads to rearrangement
HBO gives anti markonikov's product
15. Conceptual
- 16.

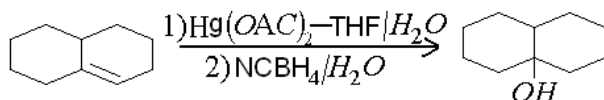


17. $\text{CH}_2 = \text{CH}-\text{O}-\text{CH}_2-\text{CH}_3 \xrightarrow{\text{H}_3\text{O}^+} \text{CH}_3\text{CHO} + \text{CH}_3\text{CH}_2\text{OH}$
18. S_N^2 reaction
19. due more stable carbo cation
20. Conceptual
21. product is phenophthalein
22. reduction of aromatic aldehydes produces aromatic alcohols
23. in compound II steric repulsions exists
24. In gauche conformer hydrogen bond is present
Squaric acid is a strong dibasic acid

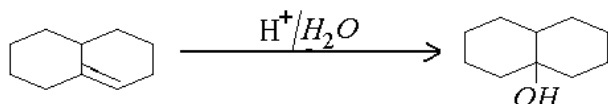
25. hydration leads to rearrangement
HBO gives anti markonikov's product

26. Conceptual

27. a)



b)



28. Conceptual

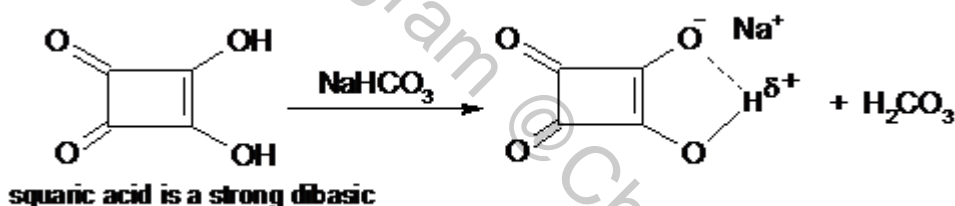
29. For being functional isomers, functional group should not match.
(Phenol and aliphatic alcohol are considered as different functional groups)

30. due to more stable carbocation

31. (ABC)

32. product is phenolphthalein

33.



34. Conceptual

35. Conceptual

36.

(A), (C)

(B) & (D) give saytzeff albene

37. BCD

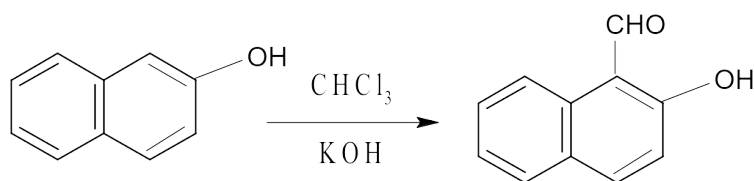
38. SOL; x, y may be ortho and para salicylic acids

(i) ortho salicylic acid is more acidic more volatile due intra molecular hydrogen bonding

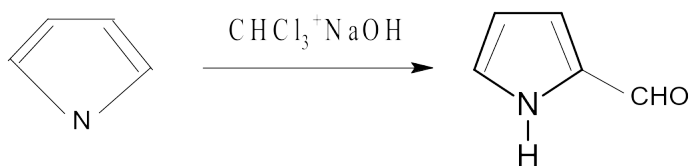
(ii) para salicylic acid has more solubility and have high melting point due inter molecular hydrogen bonding

39. SOL: as in pinacol pinacolone rearrangement NH_2 group is diazotised and N_2 is liberated and alkyl shift takes place and ketone is formed

40. (A)



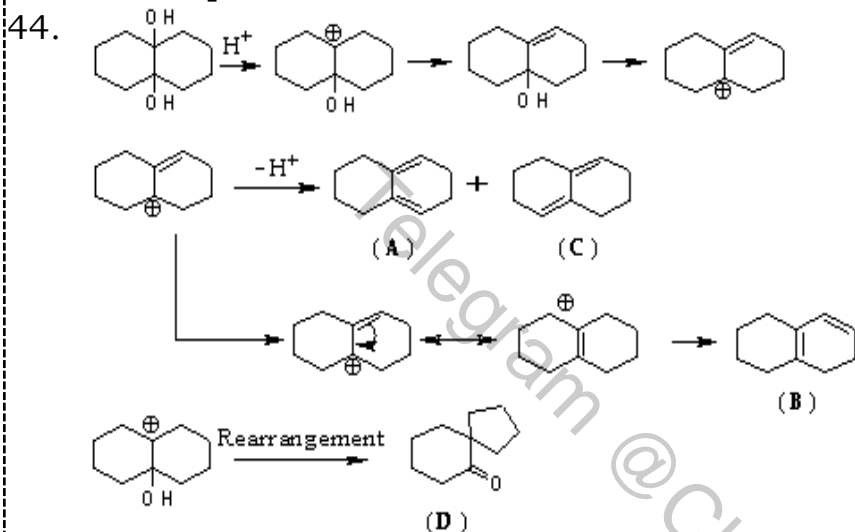
(B)



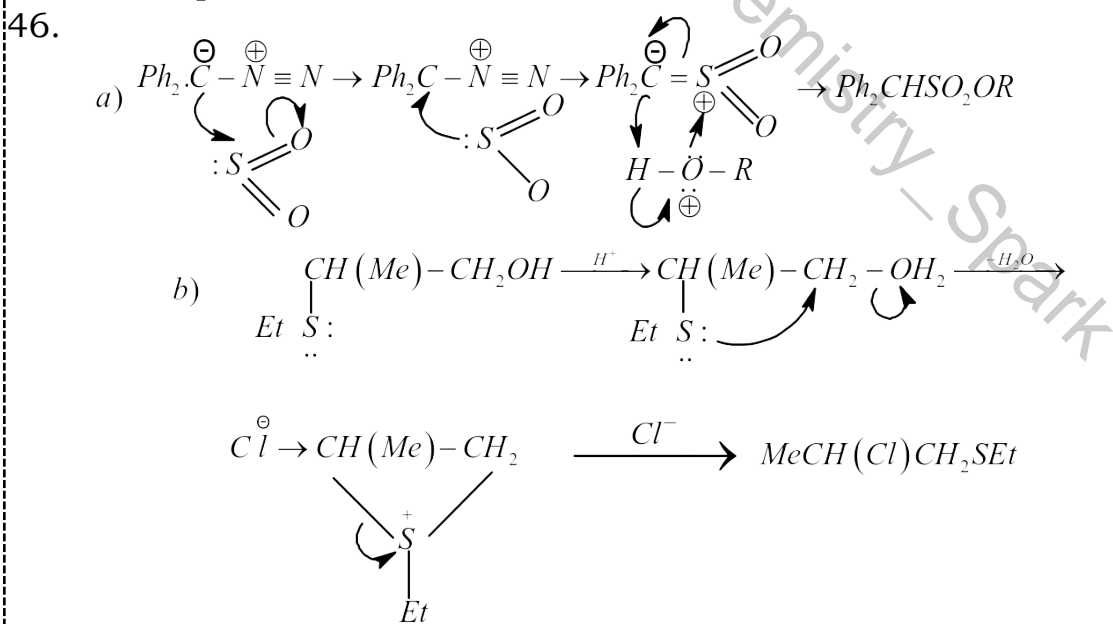
41. a) Claisen rearrangement b) nitrophenol is formed
c) Dakin's reaction d) amino phenol is formed

42. Conceptual

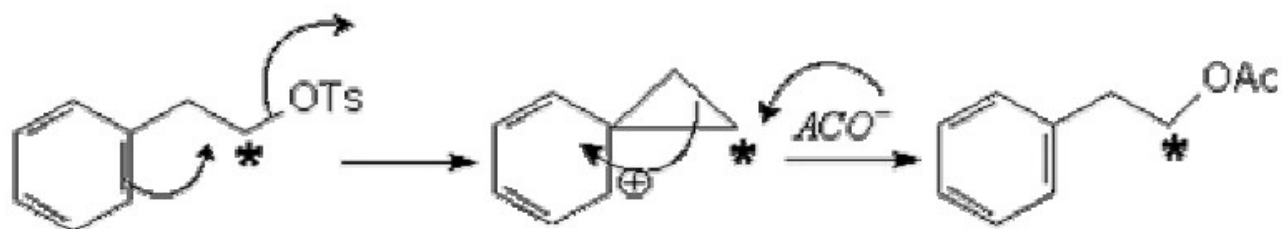
43. Nucleophilic substitution.



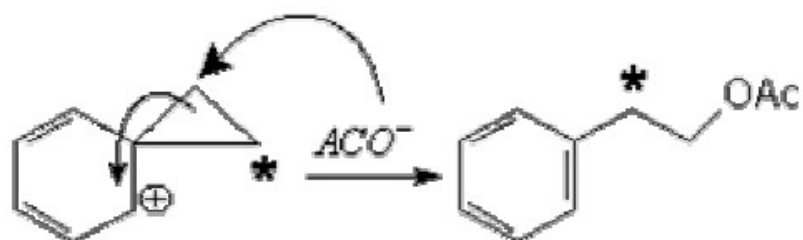
45. Conceptual



47.



And



This is due to NGP of π -bond pair of e^- s of benzene

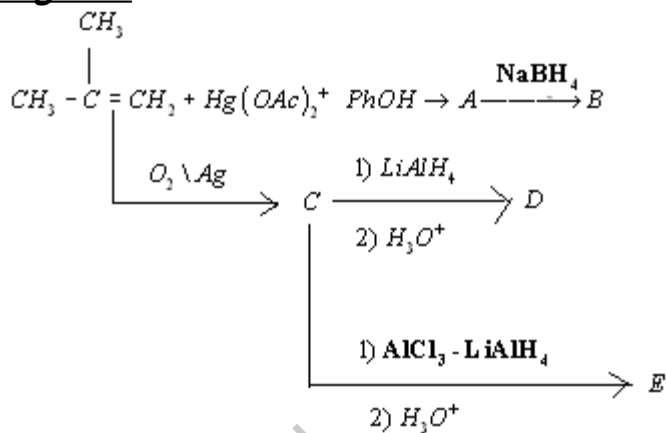
48. Conceptual
49. ABC

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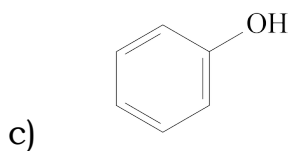
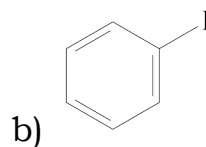
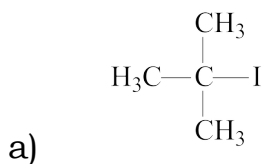
ALCOHOLS, PHENOLS, ETHERS

Comprehensions type questions:

Passage - 1

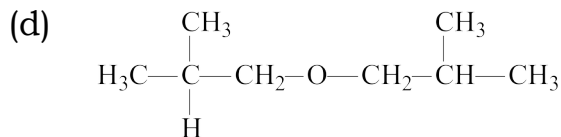
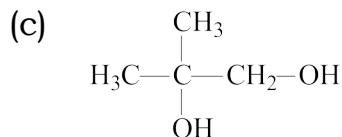
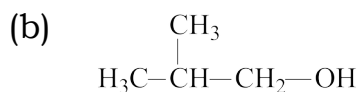
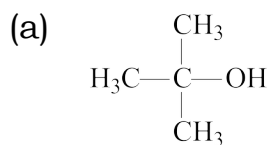


1. The compound $\text{B} \xrightarrow{\text{HI}}$

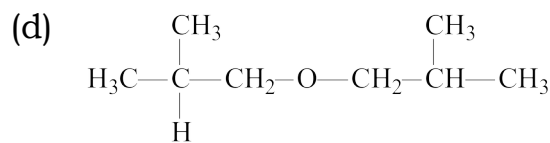
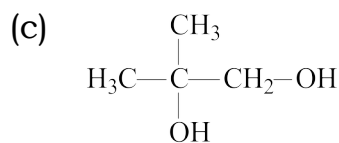
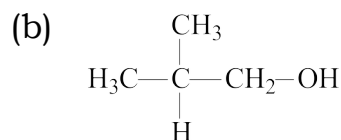
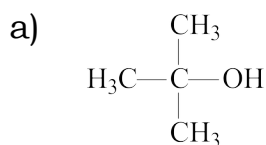


d) both a) and c)

2. The compound D is



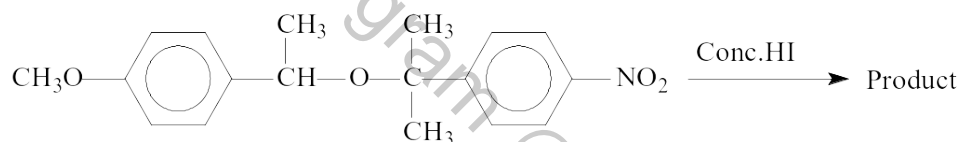
3. The compound E is



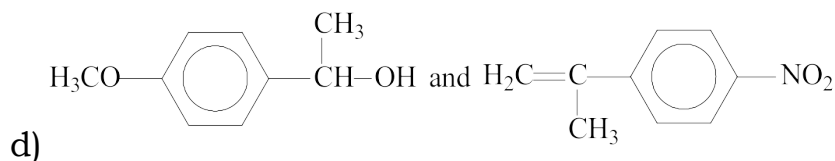
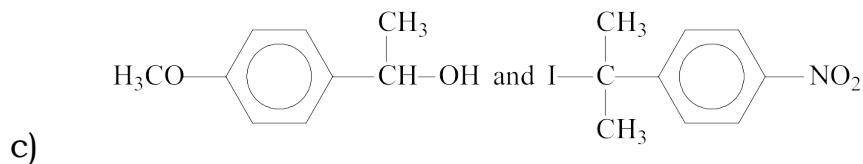
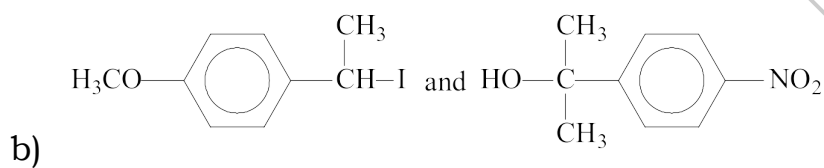
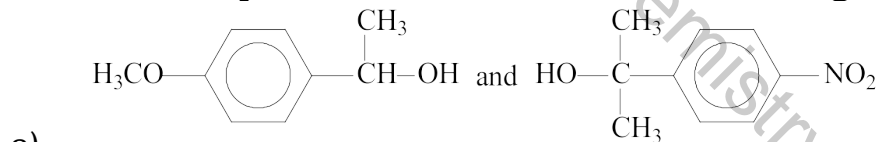
Passage - 2

Ethers are widely used as solvents due to its relatively unreactive nature. In the acidic medium reactivity is significant. The most common reaction of ether is cleavage of the C-O bond by strong acids. This may occur by SN-1 or E-1 mechanisms for 3° alkyl groups or by an SN-2 mechanism for 1° alkyl groups.

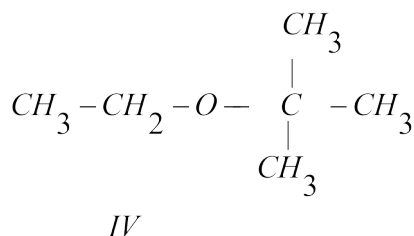
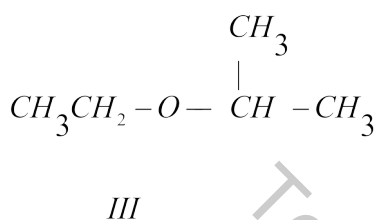
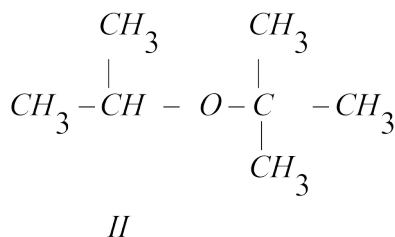
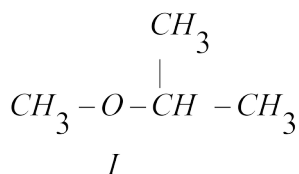
4.



Predominant products when middle ether cleavage is considered



5. The following compound on treating with conc. HI produces alcohol and alkyl halide. Which compounds form alcohol that gives positive halo form reaction



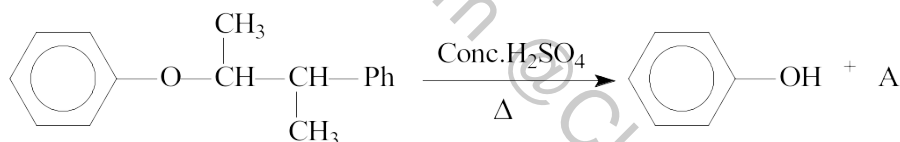
a) I, II, III, IV

c) II, and IV only

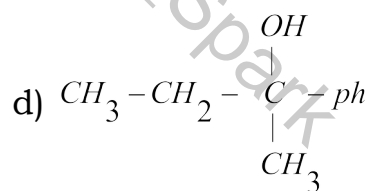
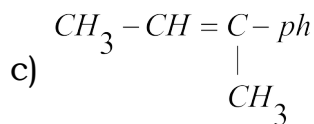
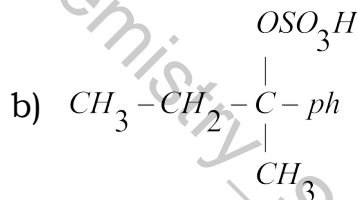
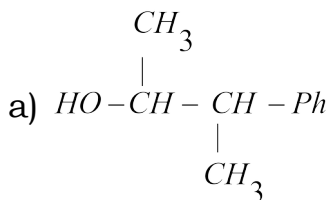
b) II, III, IV only

d) III and IV only

6.



Product A is :

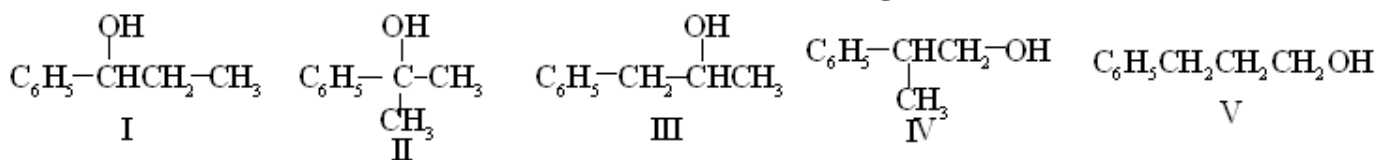


Paragraph : 3

An organic compound A ($\text{C}_9\text{H}_{12}\text{O}$) exhibits following characteristics.

- It reacts with metallic sodium to give a colourless odorless gas
- It is oxidised by KMnO_4 to benzoic acid.
- It can be resolved.
- It does not give precipitate with iodine in presence of NaOH .
- It change the colour of $\text{Cr}_2\text{O}_7^{2-}$ from orange to blue, and gives a chiral compound.

On the basis of the above reaction & the following 5 structures,

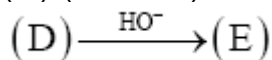


answer the following questions:

7. Which of the following given characteristics discard the possibility of compound V
 - 1) (b) 2) (c) 3) (d) 4) (e)
 - A) (1) & (2) B) (2) & (4) C) (1), (2) & (3) D) all the four
8. The above characteristics establish the structure of A as
 - A) I B) II C) both A & D D) IV
9. The total number of isomeric alcohols to IV would be
 - A) 4 B) 6 C) 8 D) 9

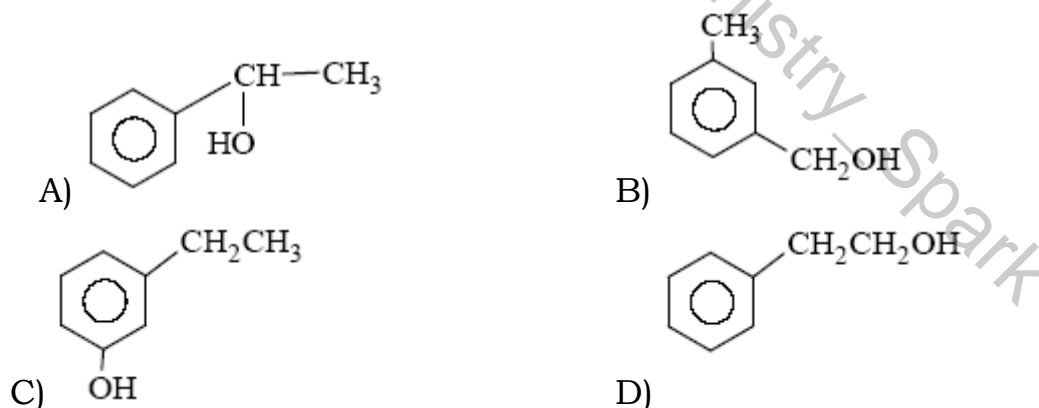
Paragraph : 4

Compound A ($\text{C}_8\text{H}_{10}\text{O}$) on reaction with MnO_2 gives B ($\text{C}_8\text{H}_8\text{O}$). Treatment of (B) with 2-equivalent of Br_2 yields (C) $\text{C}_8\text{H}_6\text{OBr}_2$ which on basic hydrolysis gives (D) ($\text{C}_8\text{H}_8\text{O}_3$).

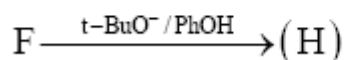
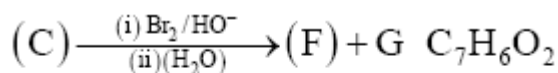


(E) liberates CO_2 on treatment with NaHCO_3 and is resolvable.

10. Compound (A) is



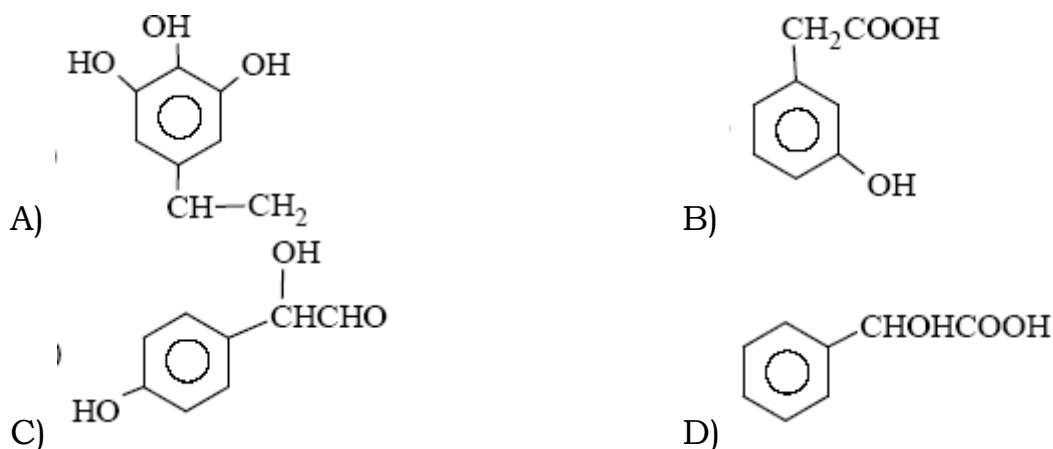
- 11.



Incorrect statement is

- (A) H is formed through carbene intermediate
- (B) G on treatment with NaOH/CaO gives benzene
- (C) Formation of 'F' involves nucleophilic substitution on 'C'
- (D) (C) is a carboxylic acid

12. Compound E is



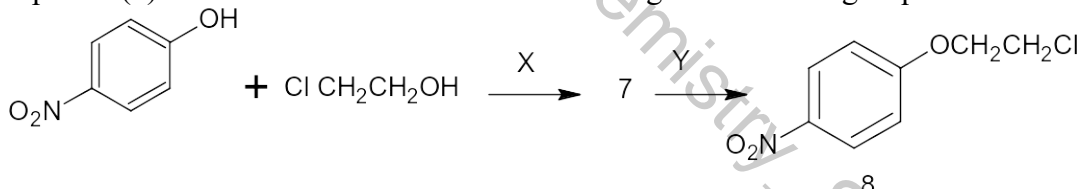
Paragraph : 5

A drug dofetinilide (1) is used for the treatment of cardiac arrhythmia, which is fatal heart disease prominent among the developed countries. The synthesis of dofetinilide may require simple starting compounds like 1-bromo-2-phenylethane(2), bromobenzene(3) and phenol(4).

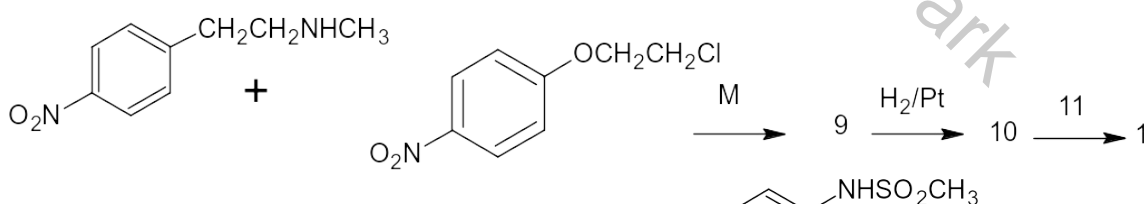
In the nitration of (2) and (3) with the nitrating mixture ($\text{HNO}_3 + \text{H}_2\text{SO}_4$), the major product was found to be para isomer.

Phenol is nitrated using NaNO_3 and H_2SO_4 in water. In this reaction significant amount of another compound (5) is formed along with P- nitro phenol (6)

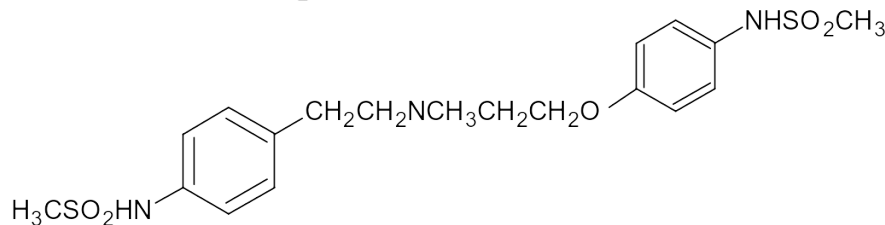
Compound (6) is converted into intermediate 8 through the following sequence



1 is synthesised by reacting 8 with another compound as follows



1 is

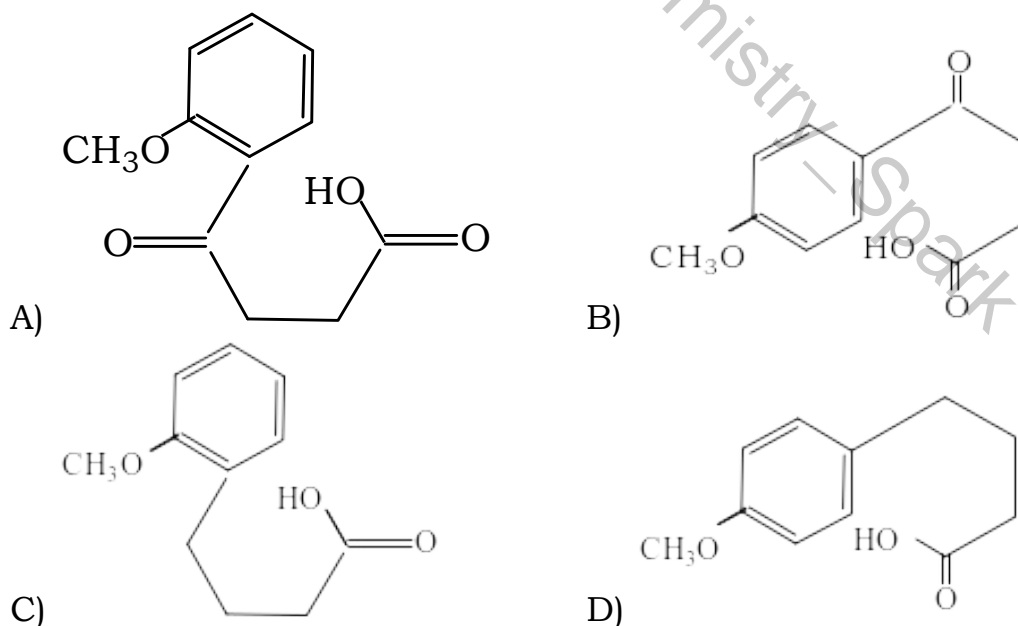


13. Identify the correct statements regarding compound 5
- I) 5 is more acidic than 6 II) 5 is less acidic than 6
 III) 5 has lesser boiling point than 6 IV) 5 has higher boiling point than 6
- (A) I, IV (B) II, III
 (C) I, III (D) IV, II
14. What are the possible options for X?
- I) NaOH II) Na₂CO₃ III) AlCl₃ IV) SOCl₂
 V) Ca(OH)₂
- (A) I, II, V (B) I, V
 (C) III, IV (D) I, IV, V
15. Identify the incorrect statement regarding the compound 1
- (A) it reacts with aqueous acids
 (B) it reacts with aqueous bases
 (C) it contains two types of nitrogen which are equally basic
 (D) it contains two types of nitrogen whose basic character cannot be compared

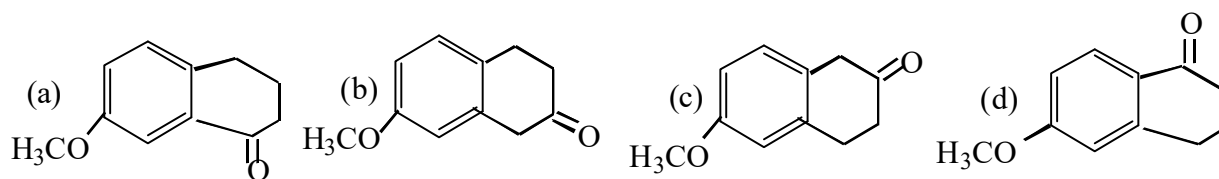
Passage -6

Anisole + Succinic anhydride $\xrightarrow{\text{AlCl}_3}$ A $\xrightarrow{\text{Zn - Hg/conc.HCl}}$ B
 $\xrightarrow{\text{HF}}$ C $\xrightarrow{\text{Zn - Hg/conc.HCl}}$ D $\xrightarrow{\text{Se}}$ E In the sequence of the above reactions:

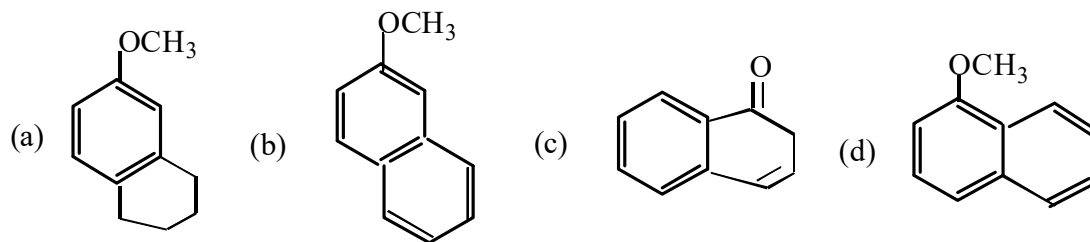
16. A is:



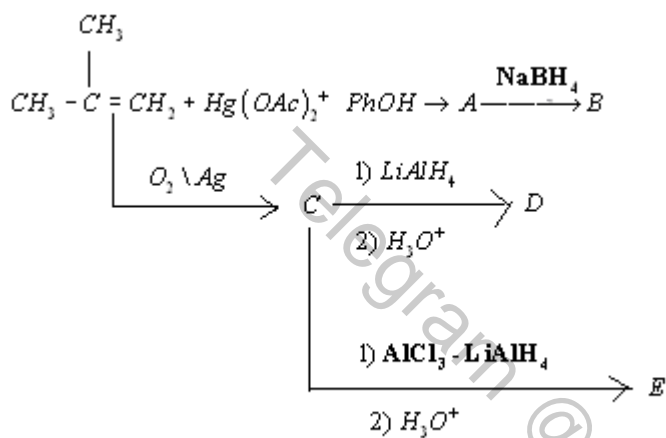
17. C is:



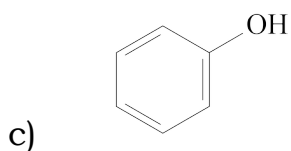
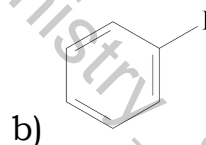
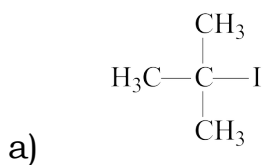
18. D is:



Passage - 7

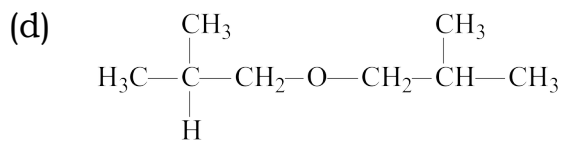
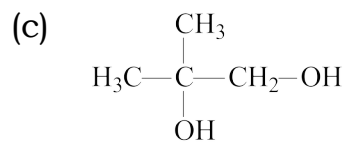
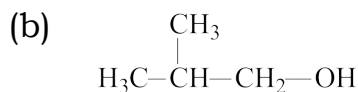
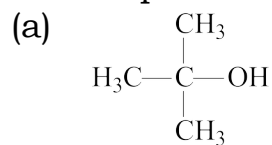


19. The compound $\text{B} \xrightarrow{\text{HI}}$

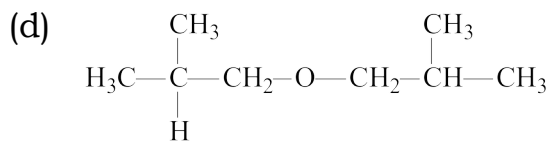
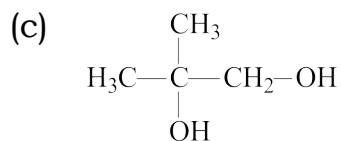
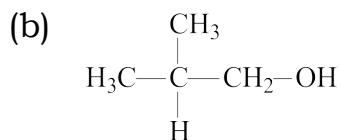
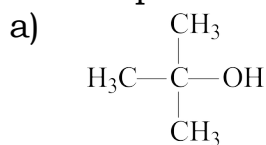


d) both a) and c)

20. The compound D is



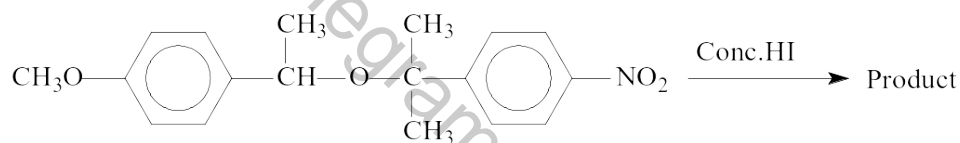
21. The compound E is



Passage - 8

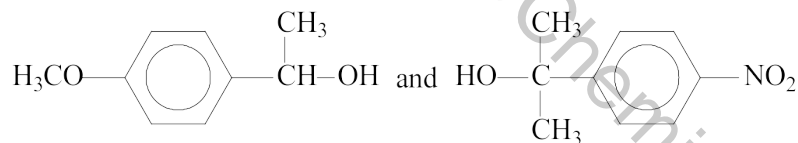
Ethers are widely used as solvents due to its relatively unreactive nature. In the acidic medium reactivity is significant. The most common reaction of ether is cleavage of the C-O bond by strong acids. This may occur by SN-1 or E-1 mechanisms for 3° alkyl groups or by an SN-2 mechanism for 1° alkyl groups.

22.

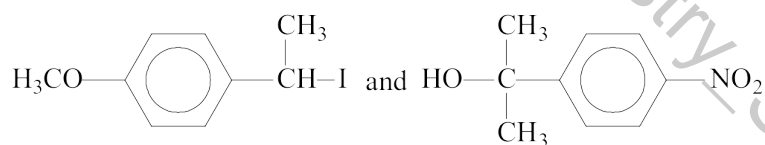


Predominant products when middle ether cleavage is considered

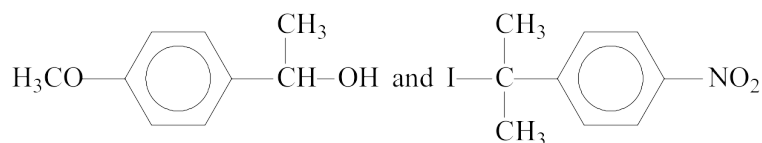
a)



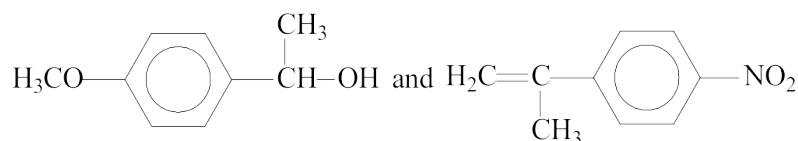
b)



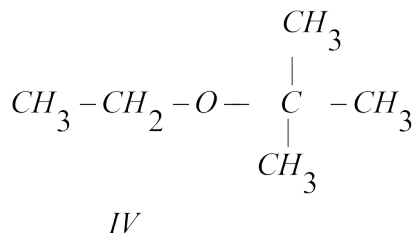
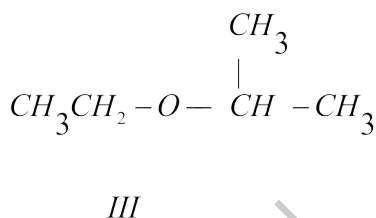
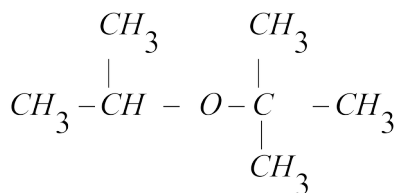
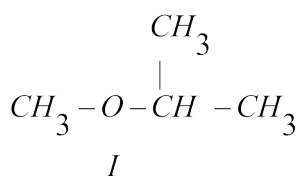
c)



d)



23. The following compound on treating with conc. HI produces alcohol and alkyl halide. Which compounds form alcohol that gives positive halo form reaction



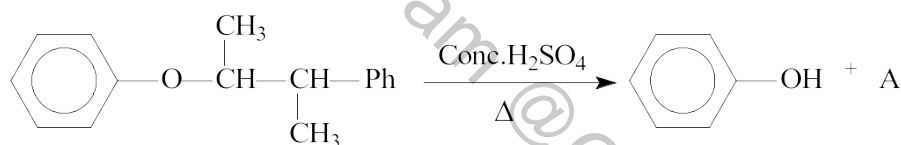
a) I, II, III, IV

c) II, and IV only

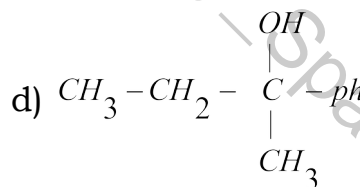
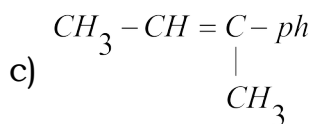
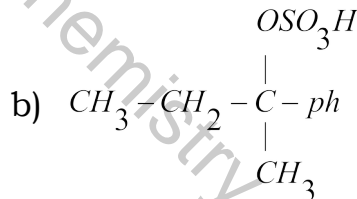
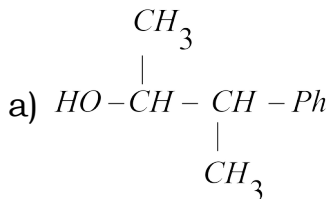
b) II, III, IV only

d) III and IV only

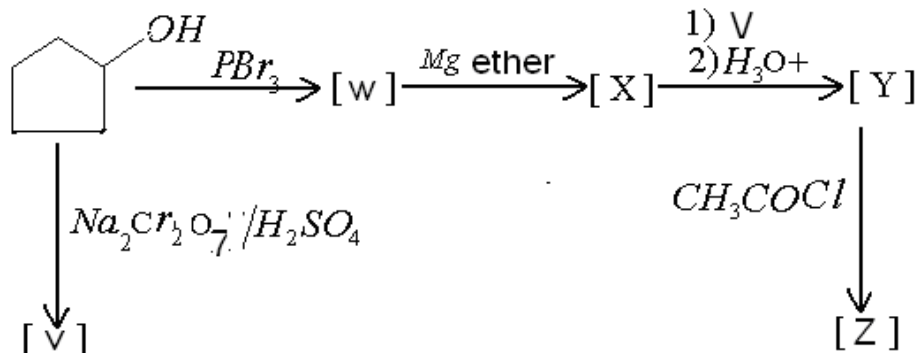
24.



Product A is :



Passage - 9

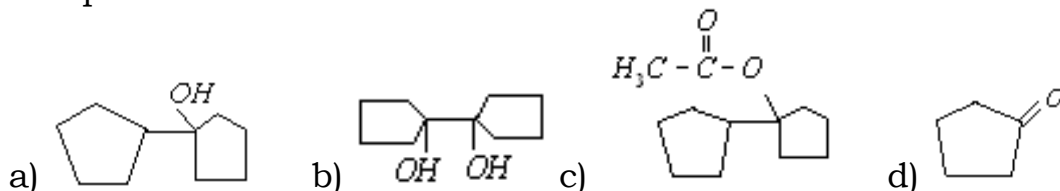


25. Conversion of (X) to (Y) is

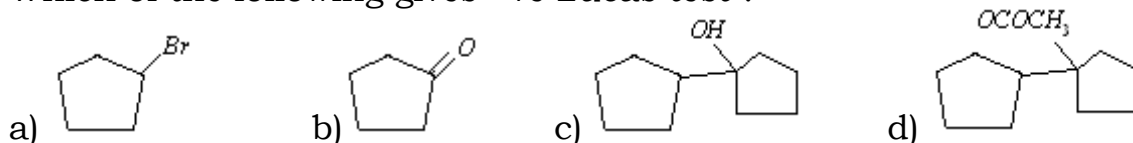
- a) Nucleophilic substitution
c) Electrophilic addition

- b) Nucleophilic addition
d) Electrophilic substitution

26. The product z is



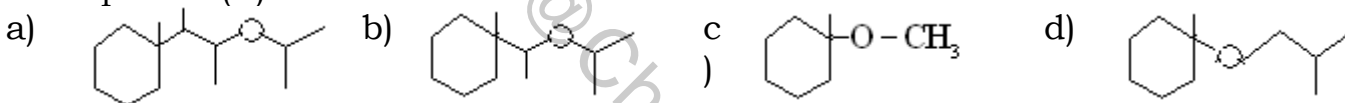
27. Which of the following gives +ve Lucas test ?



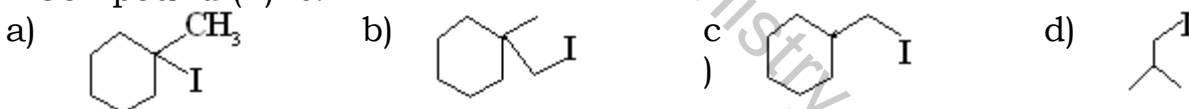
Passage- 10

A volatile organic compound (X) on reaction with HI gives two products (Y) and (Z). Z gives red colour in Victor Meyer test but when (Z) is heated with conc. H_2SO_4 followed by hydrolysis gives (P), which immediately reacts with anhydrous $\text{ZnCl}_2 + \text{HCl}$. (Y) on treatment with $\text{C}_2\text{H}_5\text{OH} + \text{KOH}$ followed by $\text{O}_3 / \text{Me}_2\text{S}$ gives Q. (Q) can give haloform test. (Q) when heated with NaOH gives (R). (R) also gives haloform test and can decolourise Br_2 water.

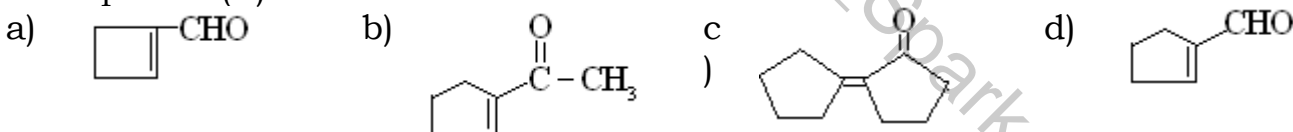
28. Compound (X) is



29. Compound (Y) is.

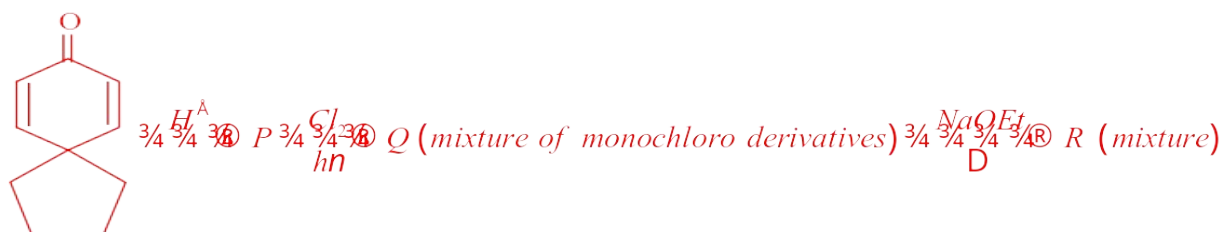


30. Compound (R) is



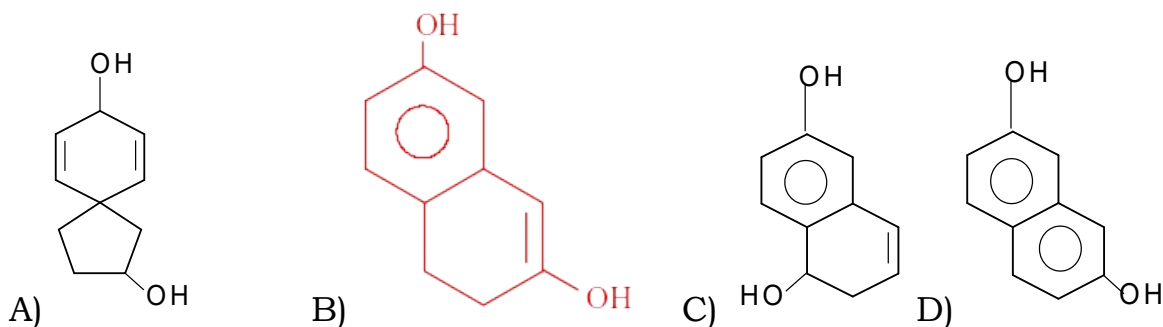
Passage- 11

Read the following reaction



Note : From 'P' to 'Q' assume that chlorination is happening at the carbons adjacent to a conjugative system

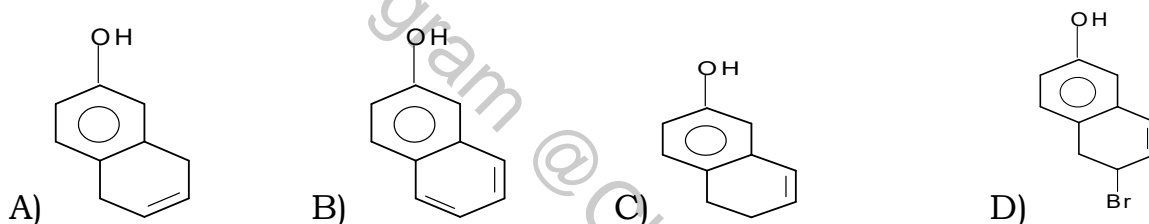
31. One of the compounds in the mixture 'T' is



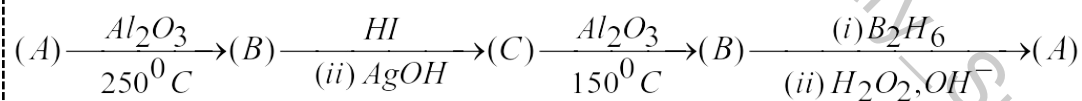
32. Total no. of isomers in mixture 'Q' on the basis of above mentioned assumption

- A) 2 B) 4 C) 6 D) 8

33. On treating mixture 'S' with strong base, product obtained is

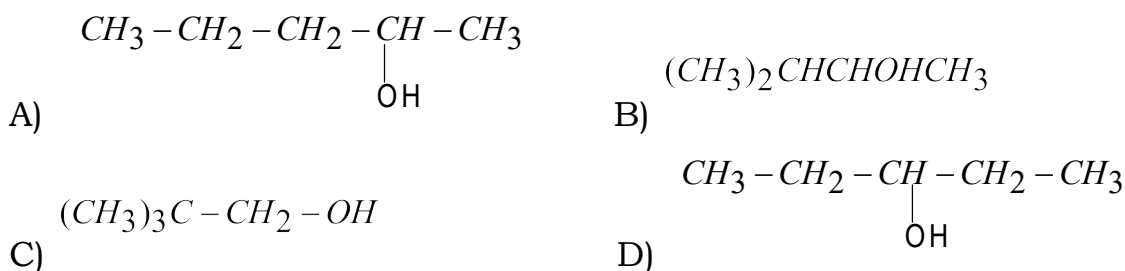


Passage- 12

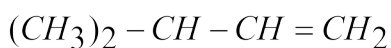


In the above reaction sequence (A) and (C) are isomers. Molecular formula of B is C_5H_{10} , which can also be obtained from the product of the reaction with CH_3CH_2MgBr and $(CH_3)_2CO$ and followed by acidification and heating.

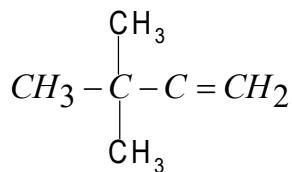
34. Identify structure of A



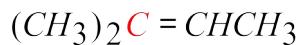
35. Identify the structure of B



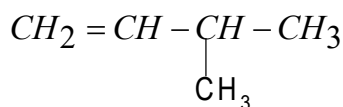
A)



B)

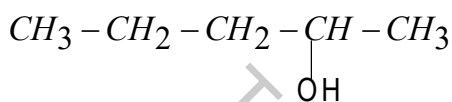


C)

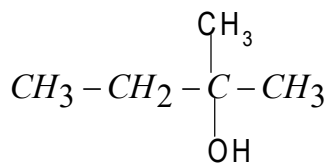


D)

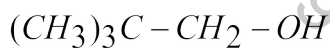
36. Identify the structure of C



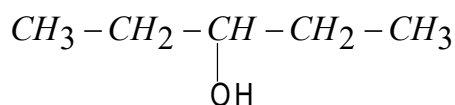
A)



B)



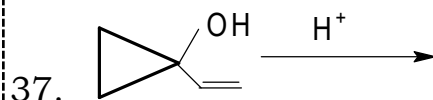
C)



D)

Paragraph - 13

Alcohols are protonated to give carbocation intermediate and if possible rearrange to relatively stable carbocations. These rearrangements include Hydride, methanide 1,2 & 1,4- shifts and ring expansions.

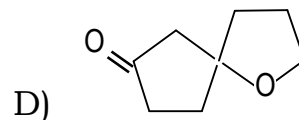
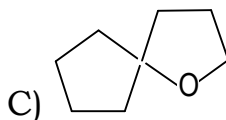
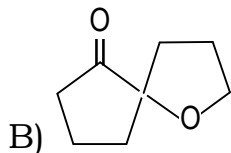
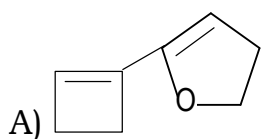
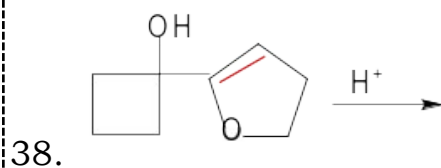


A) 2-Methyl cyclobutanone

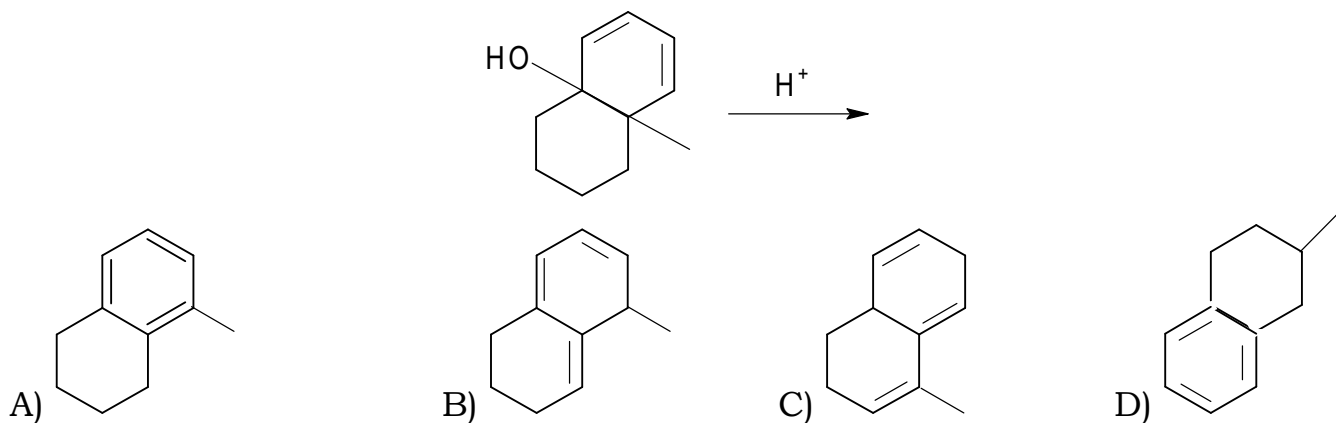
B) 3-Methyl cyclobutanone

C) Methyl cyclopropane

D) Methyl cyclobutane



39. The major product of the reaction is

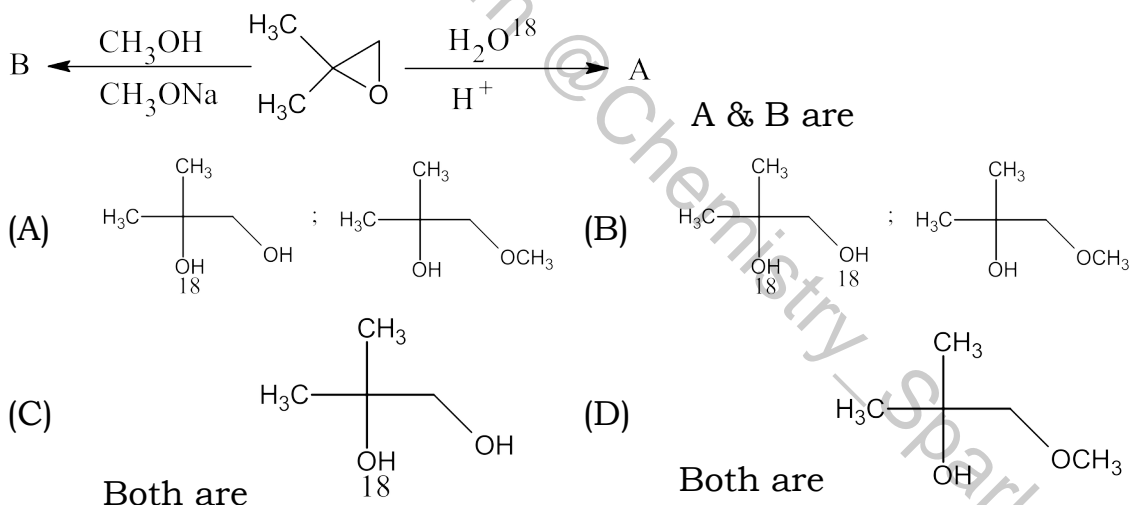


Paragraph – 14

Epoxides are three membered cyclic ethers and differ from other cyclic and acyclic ethers in that they are reactive to various reagents. The reason for this reactivity is the strained three membered ring. Reactions with nucleophiles can result in ring opening and relief of strain.

Nucleophiles will attack either of the electrophilic carbons present in an epoxide by an S_N2 reaction.

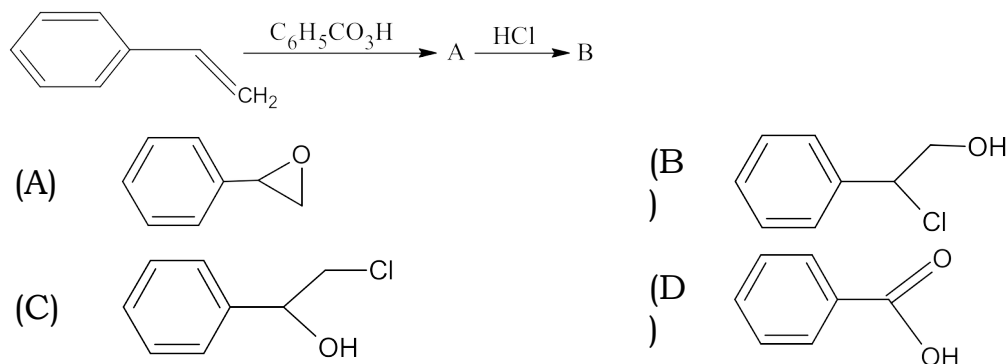
40.



41. Which of the following reagent can be used to convert ketone into ester in single step mechanism?

- (A) HCOOOH (B) NaOBr (C) NaCN / H^+ (D) i) Mg/ether ii) H_3O^+

42. The product B in the following sequence of reaction is



Paragraph – 15

Although chlorobenzene is inert to nucleophilic substitutions, it gives quantitative yield of phenol when heated with aq. NaOH at high temperature and under high pressure. Phenol, so formed, is a weaker acid than the carboxylic acid, hence it dissolves only in strong base like NaOH, but not weak like NaHCO_3 . It reacts with acid chlorides and acid anhydrides in the absence of AlCl_3 to form esters. As far as nucleophilic substitution in phenol is concerned, the -OH is an activating group, hence its presence enhances the electrophilic substitution in the ortho and para position.

Condensation with formaldehyde is one of the important properties of phenol. The condensation may take place in presence of acids or alkali and leads to the formation of Bakelite, an important industrial polymer.

43 Conversion of chlorobenzene into phenol involves:

- A) Modified $\text{S}_{\text{N}}1$ mechanism B) Modified $\text{S}_{\text{N}}2$ mechanism
C) Both (a) and (b) D) Elimination addition

44 The o acylation of phenols with acid anhydrides can be catalysed by

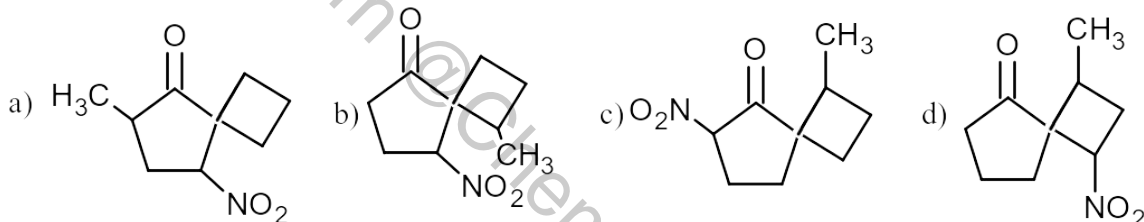
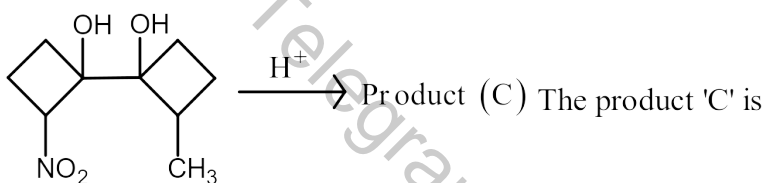
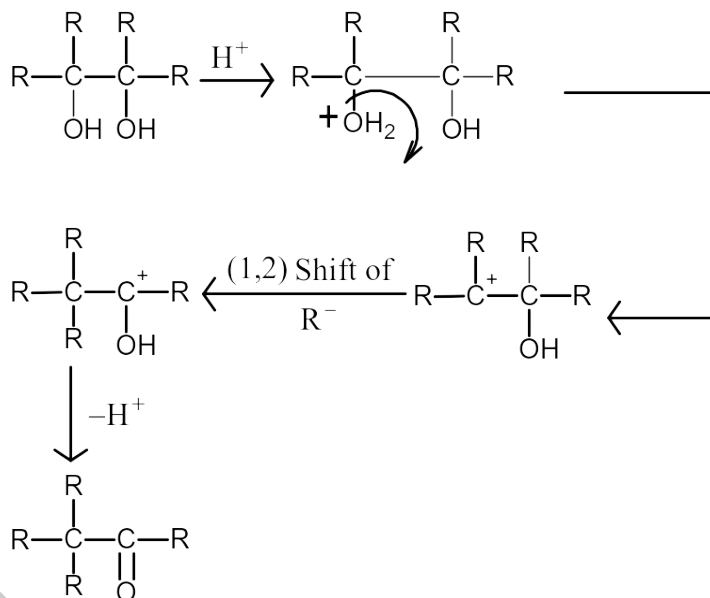
- A) Sulphuric acid B) NaOH C) Both D) None

45 Condensation of phenol with formaldehyde is an electrophilic substitution, in which

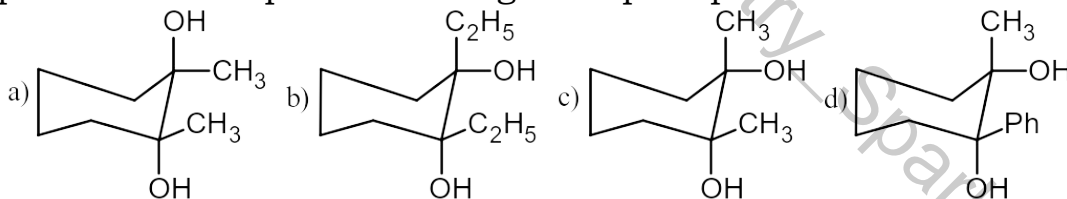
- A) $\text{H}_2\text{C}=\text{O}$ as such is the electrophile in both acidic as well as basic medium.
B) $\text{H}_2\text{C}=\text{O}$ is the real electrophile in acidic medium while in basic medium $^+\text{CH}_2-\ddot{\text{O}}$ is the real electrophile.
C) $\text{H}_2\text{C}=\ddot{\text{O}}\text{H}$ and $\text{CH}_2=\text{O}$ are the electrophiles in acidic and basic medium respectively.
D) $\text{H}_2\text{C}=\text{O}$ and $^+\text{CH}_2-\ddot{\text{O}}$ are the electrophiles in acidic and basic medium respectively.

Paragraph – 16

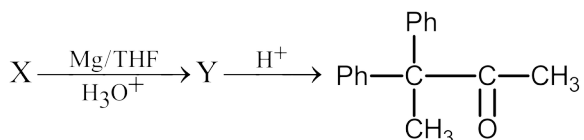
Pinacol is a 1,2, diol which on treating with acid produces pinacolone (ketone). It is an intramolecular rearrangement. The reaction starts with the protonation of hydroxyl group followed by elimination of water and formation of carbocation. The carbocation is then stabilized by Whitmore 1,2 shift.



47. Which of the following a compounds, on pinacol-pinacolone rearrangement produces a compound which gives a precipitate with KOI ?



48.

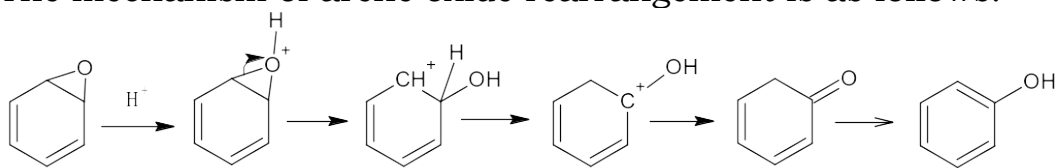


Which of the following is not correct about the compound X and Y ?

- (X) is can be reduced to 1-phenylethane on treating with $\text{N}_2\text{H}_4 / \text{C}_2\text{H}_5\text{O}^-$
- (X) on treating with $\text{H}_2\text{N}-\text{OH} / \text{H}^+$ followed by treating with PCl_5 produces two amides.
- (Y)- may be obtained by the crossed reductive coupling between acetone and benzophenone.
- (X) gives yellow precipitate with NaOI.

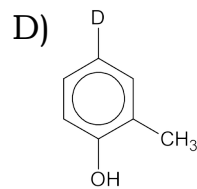
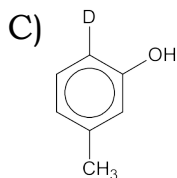
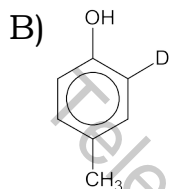
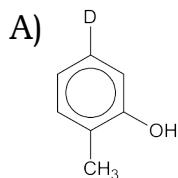
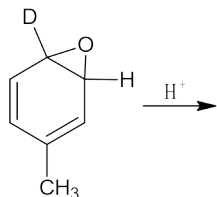
Paragraph - 17

The mechanism of arene oxide rearrangement is as follows:

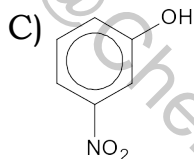
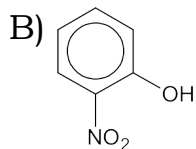
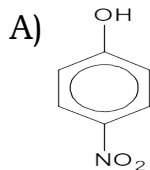
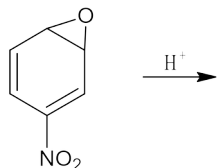


In all the reactions of arene oxide rearrangement, first Carbocation is stabilized and then major products are decided.

49.

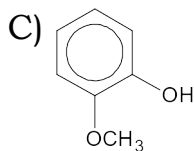
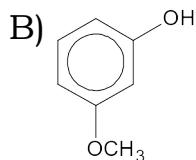
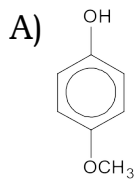
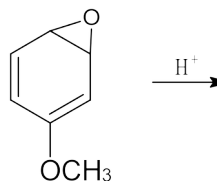


50.



D) All

51.



D) All

AEP – KEY SHEET

Comprehensions Answers

1	D	2	A	3	B	4	B	5	A	6	C
7	D	8	D	9	C	10	A	11	C	12	D
13	B	14	A	15	A	16		17		18	
19	D	20	A	21	B	22	B	23	A	24	C
25	B	26	C	27	C	28	D	29	A	30	B
31	C	32	C	33	B	34	B	35	C	36	B
37	A	38	B	39	A	40	A	41	A	42	B
43	D	44	C	45	C	46	B	47	A	48	C
49	B	50	C	51	A						

Telegram @Chemistry_Spark

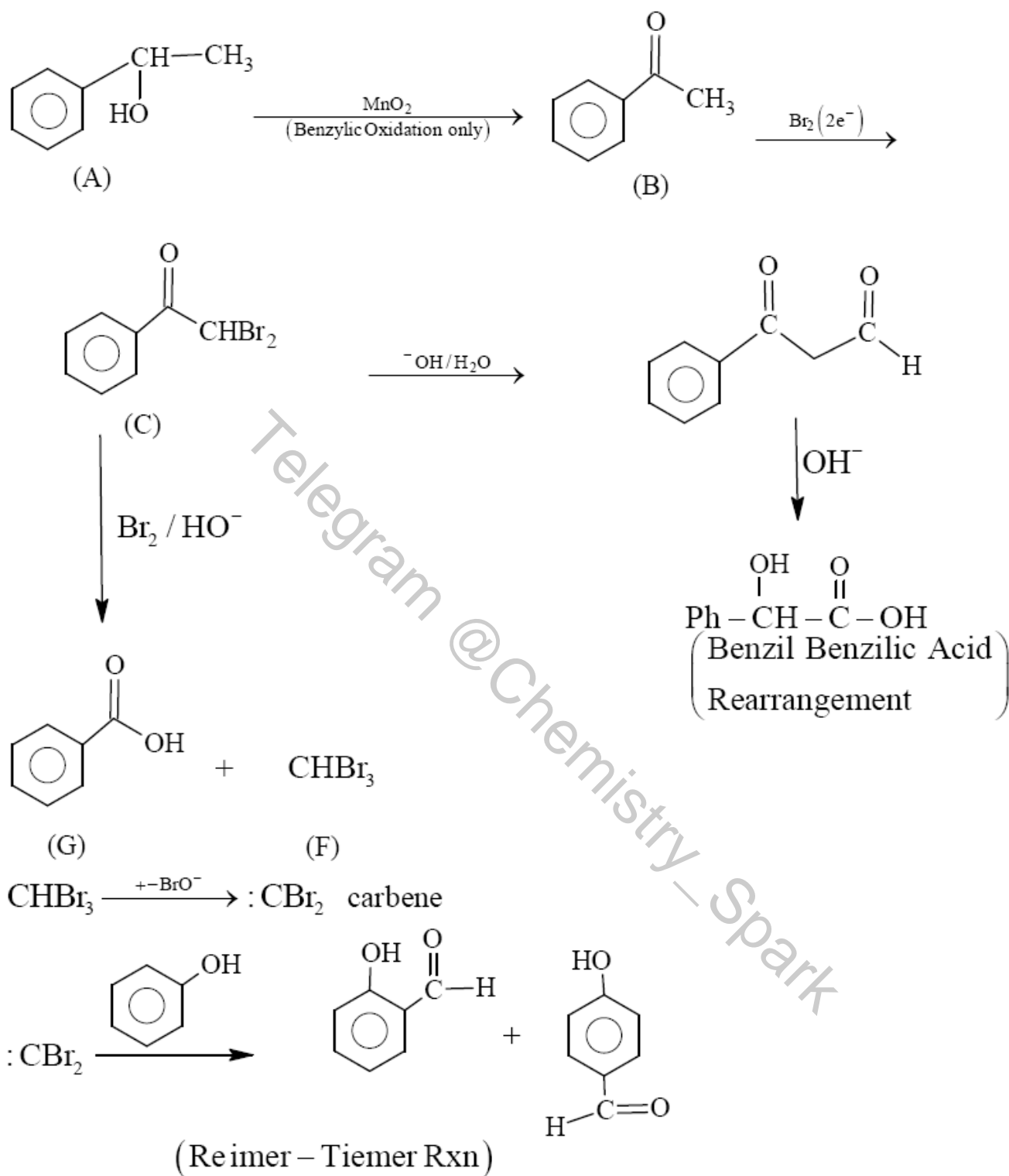
AEP – SOLUTIONS

Comprehensions solutions

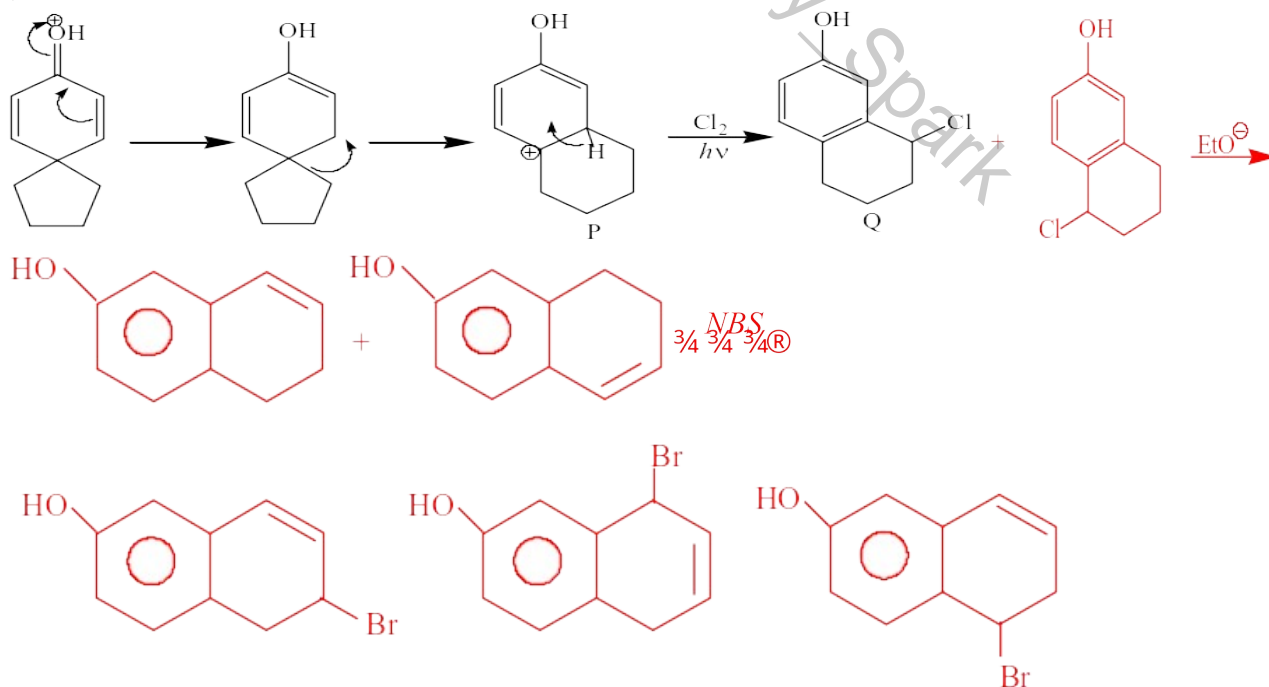
1. D
2. A
3. B
4. B
5. A
6. H_2SO_4 causes dehydration
7. D
8. D
9. C

Telegram @Chemistry_Spark

10, 11, 12

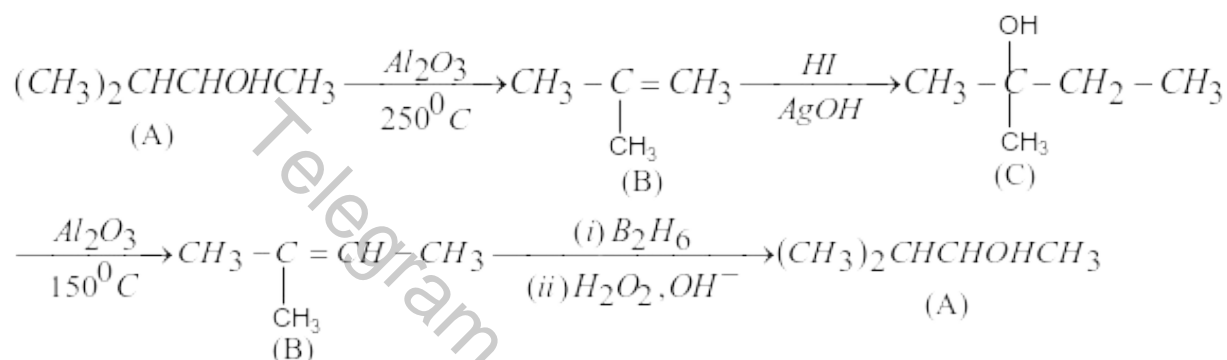


13. Conceptual
14. Conceptual
15. Conceptual
16. Conceptual
17. Conceptual
18. Conceptual
19. Conceptual

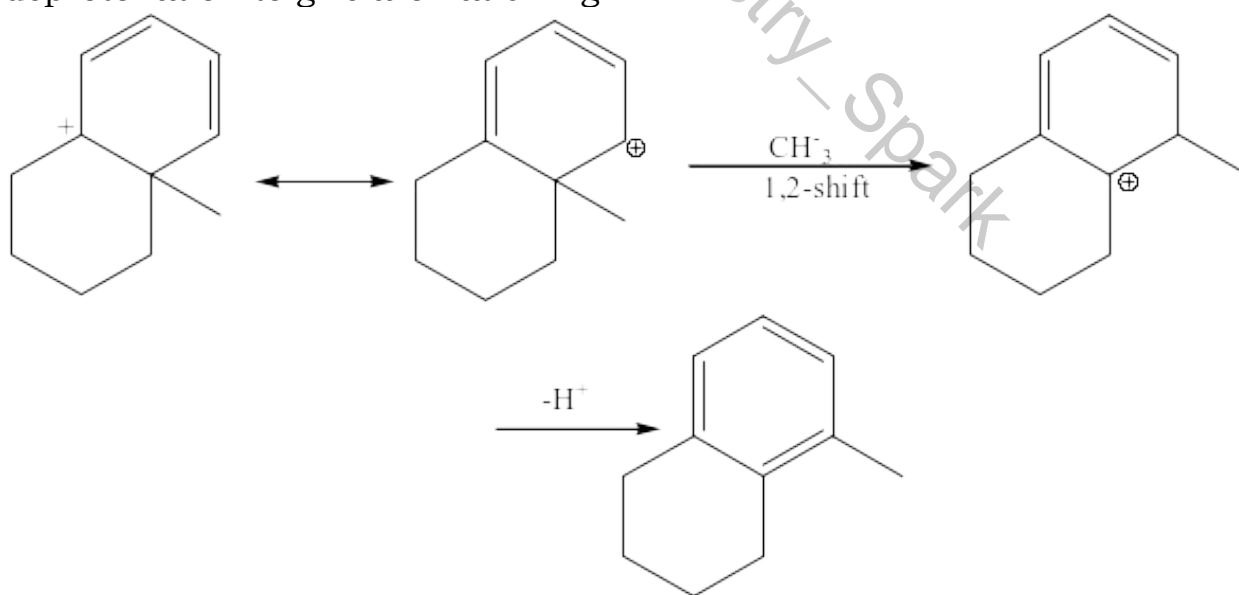




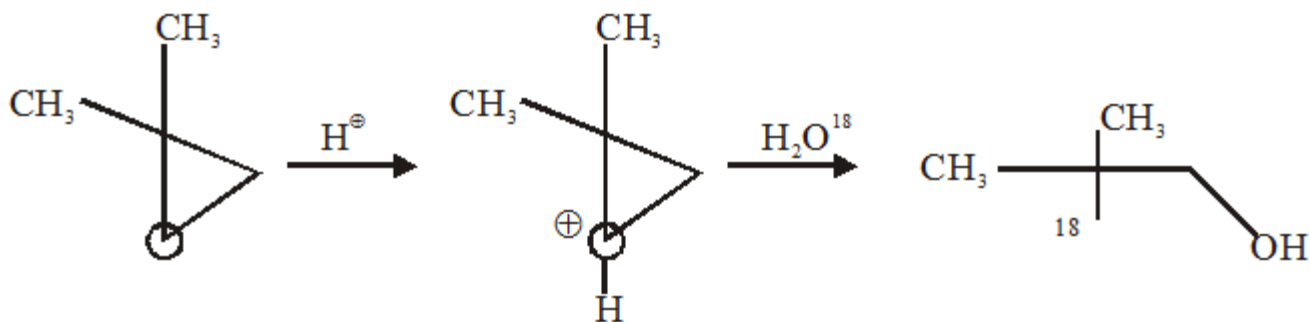
34, 35 & 36



37. Protonation of C = C followed by ring expansion and finally deprotonation occurs.
38. Protonation of C = C followed by ring expansion and finally deprotonation occurs.
39. Protonation of -OH followed by removal of water and CH_3^- 1,2-shift and deprotonation to give aromatic ring

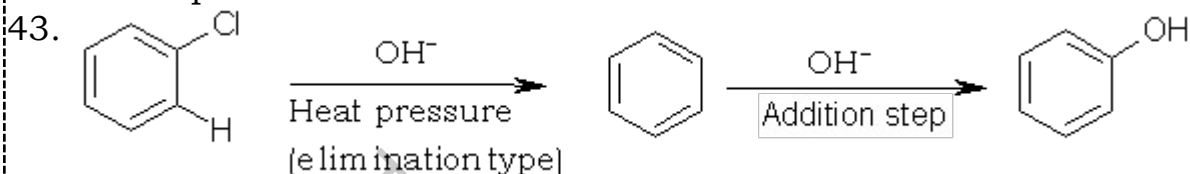


40.



41. Conceptual

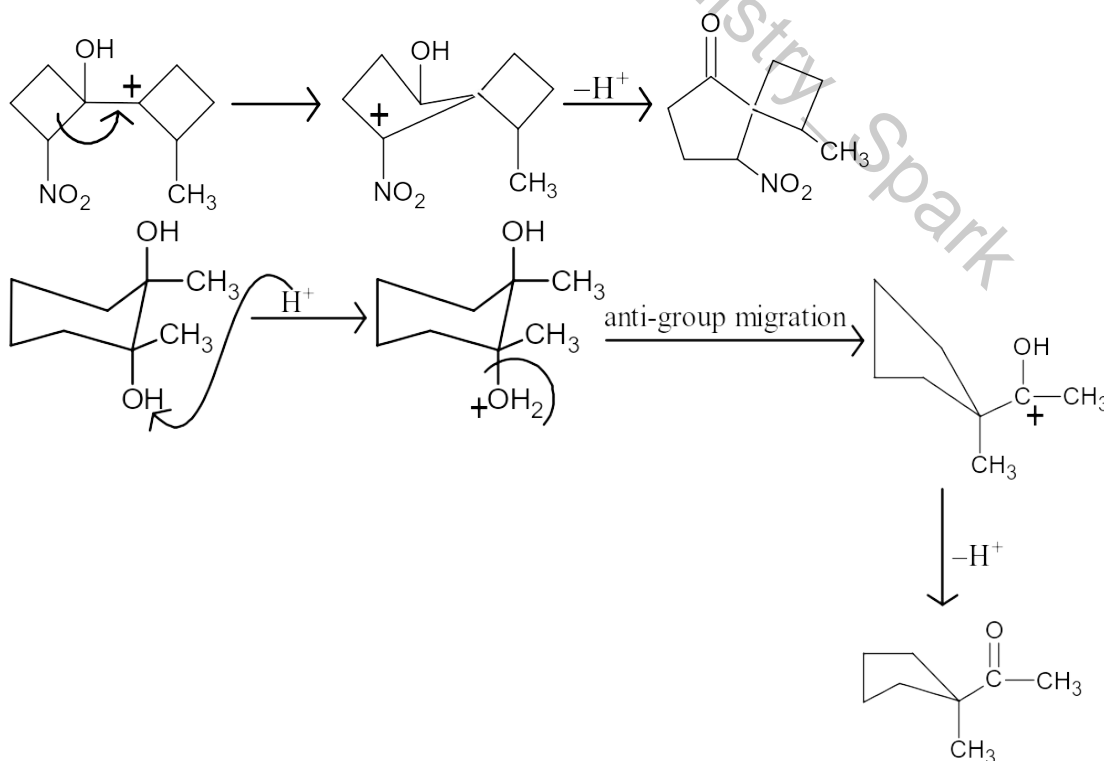
42. Conceptual



44. Acid H_2SO_4 converts acid anhydride to the more powerful electrophile, $CH_3C^+=O$ group. On the other hand base $(NaOH)$ converts phenol to the more powerful phenoxide ion.

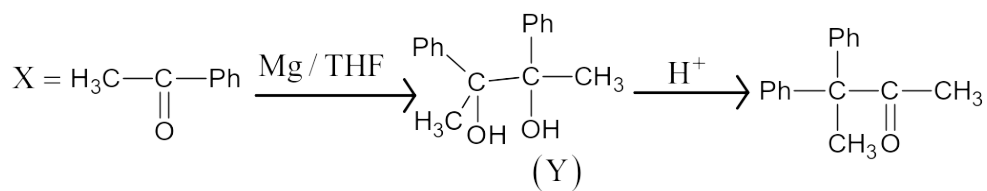
45. In presence of Acids, $CH_2=O$ is protonated to form $CH_2=O^+H$ in which carbon is made electron deficient than that in $CH_2=O$. In presence of OH^- , phenol is converted into phenoxide. $C_6H_5O^-$ Which being a strong nucleophile is easily attacked by weaker nucleophile the unprotonated $CH_2=O$.

46.

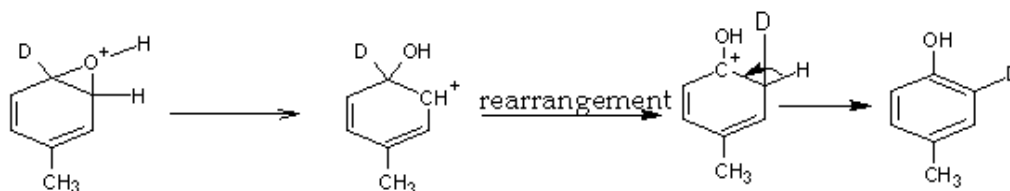


47.

48.



49.



Similarly other reactions can be explained.

50.

51.

Telegram @Chemistry_Spark

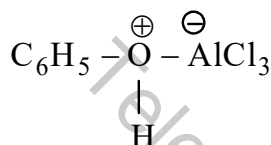
ALCOHOLS, PHENOLS, ETHERS

Statement answers type questions:

- (A) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is a **Correct** explanation for STATEMENT-1
- (B) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is **NOT a Correct** explanation for STATEMENT-1
- (C) STATEMENT-1 is True, STATEMENT-2 is False
- (D) STATEMENT-1 is False, STATEMENT-2 is True

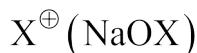
1. Statement - I: $-\text{OH}$ of phenol is highly activating group for Arse reactions but phenol is very poor substrate for Friedel - Crafts reaction.

Statement - II: Phenol is nucleophile and AlCl_3 is electrophile. Acid - base reaction between these two leads to the formation of complex



2. Statement - I: Secondary alcohol having β - methyl group undergoes haloform reaction.

Statement - II: Alcohol converts into carbonyl compound in the presence of



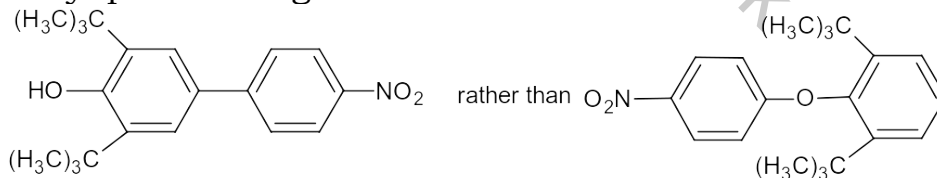
3. STATEMENT 1 : Di-tertiary butyl ether cannot be prepared by Williamson's ether synthesis.

Statement II : Tertiary Butyl bromide on treatment with sodium tertiary butoxide as it preferentially undergoes elimination to form isobutylene and tertiary butyl alcohol

4. Statement I : The acidity of alcohols follows the order $1^\circ > 2^\circ > 3^\circ$

Statement II: The +I effect of alkyl groups ($3^\circ > 2^\circ > 1^\circ$) favours the dissociation of $-\text{O}-\text{H}$ bond.

5. **Statement - 1:** p-chloronitrobenzene on reaction with sodium 2,6-di-ter-butyl phenoxide gives

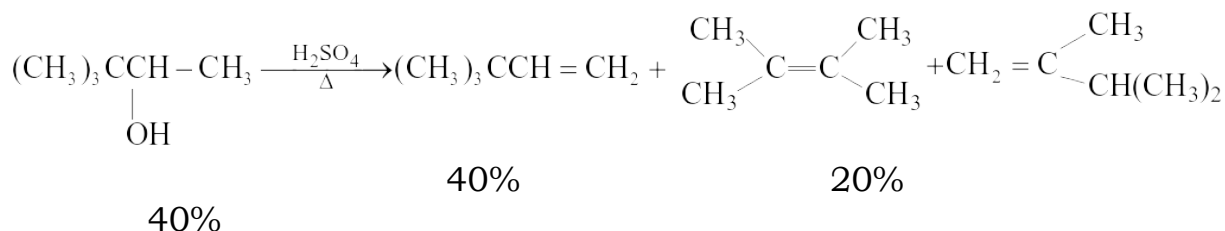


Statement - 2: Steric hinderance prevents the formation of ether.

6. STATEMENT 1: Diethyl ether when exposed to air & sunlight, it forms peroxides.

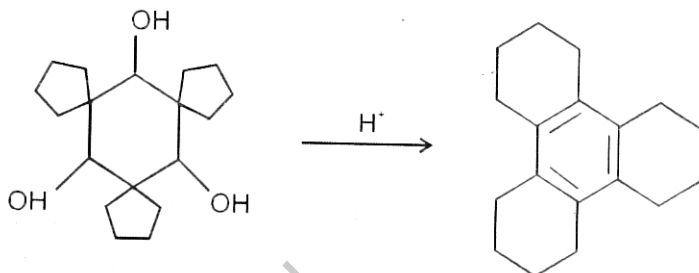
STATEMENT 2: The peroxides are detected by treating the ether with Fe^{+2} followed by KCNS, which gives blood red coloration.

7. Statement -1:

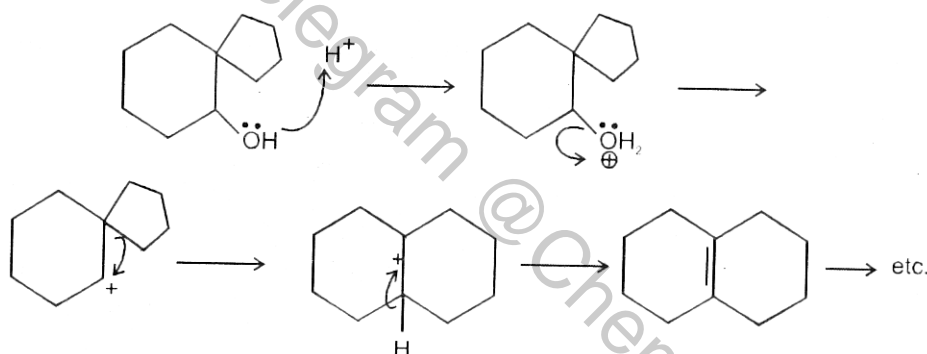


Statement – 2: It follows carbocation rearrangement and saytzeff elimination

8. Statement – 1:

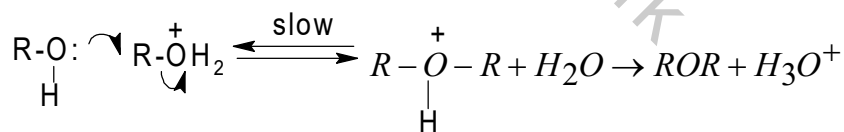


Statement – 2:

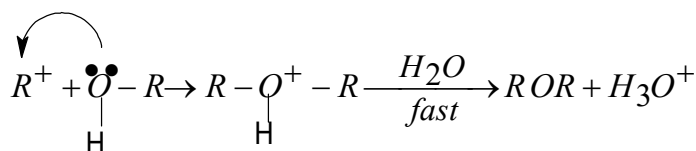
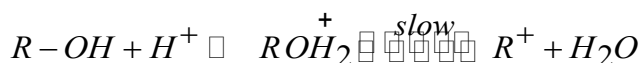


9. Statement 1 : Ethers are prepared from alcohols in acid medium through S_N1 or S_N2 mechanisms depending upon nature of alcohol

Statement 2 : $\text{ROH} + \text{H}^+ \rightleftharpoons \text{R}-\overset{+}{\text{O}}\text{H}_2$



Or

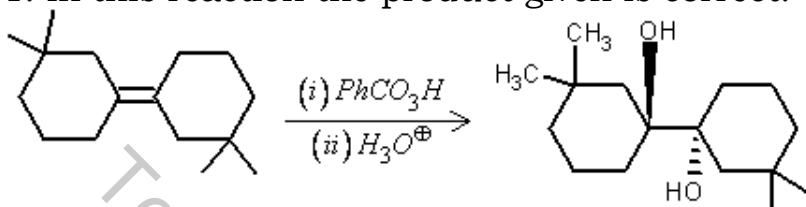


10. Statement 1 : Phenol is more reactive than benzene towards electrophilic Substitution reaction

11. Statement 1 : $CH_2=CH-OH$ more acidic than CH_3-CH_2-OH

12. Statement 1 : Phenol is soluble in $NaHCO_3$ solution

13. Statement 1: In this reaction the product given is correct.



Statement 2: In reactions involving epoxidation followed by hydrolysis, the overall addition is anti type .

AEP – KEY SHEET

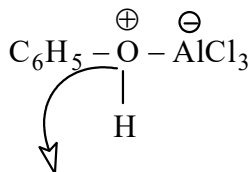
Statement Answers

[illegible]

AEP- SOLUTIONS

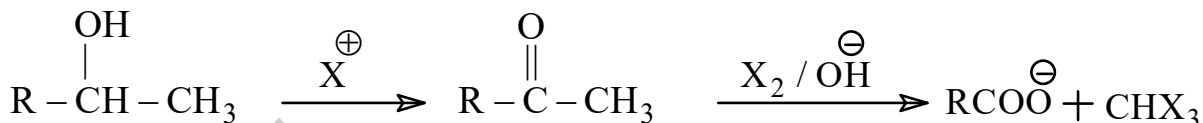
Statement solutions

1.



Group is -I group hence deactivating group

2.



3. Conceptual

4. Conceptual

5. Conceptual

6. Conceptual

7. Conceptual

8. Conceptual

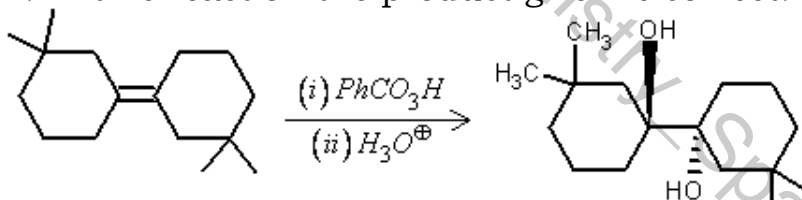
9. Ethers are prepared by substitution reaction of Alcohol.

10. -OH group is strong activating group.

11. Conjugate base of vinyl alcohol is resonance stabilised.

12. The pka value of Phenol is 9.89 where as the pka value of H_2CO_3 is 6.36

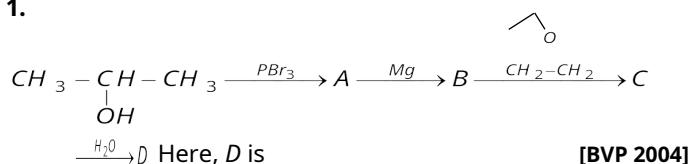
13. Statement 1: In this reaction the product given is correct.



Statement 2: In reactions involving epoxidation followed by hydrolysis, the overall

addition is anti type .

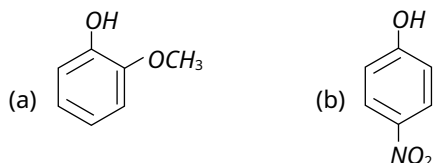
1.



- (a) $\text{CH}_3 - \underset{\text{CH}_3}{\text{CH}} - \text{O} - \text{CH}_2 - \text{CH}_3$
- (b) $\text{CH}_3 - \text{O} - \underset{\text{CH}_3}{\text{CH}} - \text{CH}_2\text{CH}_3$
- (c) $\text{CH}_3 - \underset{\text{CH}_3}{\text{CH}} - \text{CH}_2\text{CH}_2\text{OH}$
- (d) $\text{CH}_3 - \text{CH}_2 - \underset{\text{CH}_3}{\text{CH}} - \text{CH}_2\text{OH}$

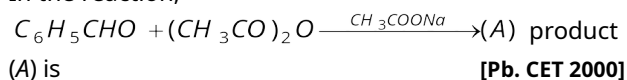
2. Phenol is more acidic than

[Pb. CET 2003]



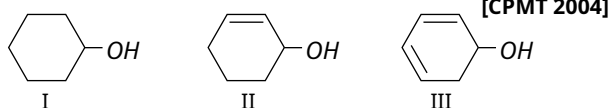
- (c) C_2H_2 (d) Both (a) and (c)

3. In the reaction,



- (a) Acetaldehyde (b) Cinnamic acid
- (c) β -naphthol (d) Phenol

4. The correct order of ease of dehydration of following is



- (a) I > II > III (b) III > II > I
- (c) I > III > II (d) III > I > II

5. PCl_5 reacts with a compound containing [Pb. CET 2002]

- (a) $-\text{SO}_3$ group (b) $-\text{OH}$ group

- (c) $-\text{NO}_3$ group (d) $-\text{NO}$ group

6. Cumene process is the most important commercial method for the manufacture of phenol. Cumene is [KCET 2004]

- (a) 1-methyl ethyl benzene (b) Ethyl benzene
- (c) Vinyl benzene (d) Propyl benzene

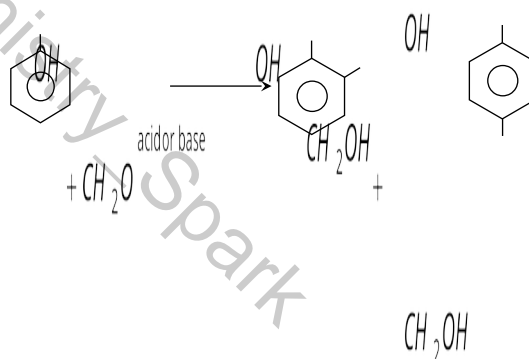
7. The compound X in the reaction [Roorkee 1999]



is

- (a)
- (b)
- (c)
- (d)

8. Reaction

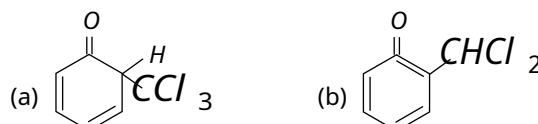


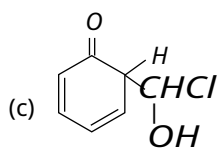
is called

[MP PET 2003]

- (a) Lederer Manasse reaction
- (b) Claisen condensation
- (c) Benzoin condensation
- (d) Etard reaction

9. When phenol is reacted with CHCl_3 and NaOH followed by acidification, salicylaldehyde is obtained. Which of the following species are involved in the above mentioned reaction as intermediate [DCE 2000]



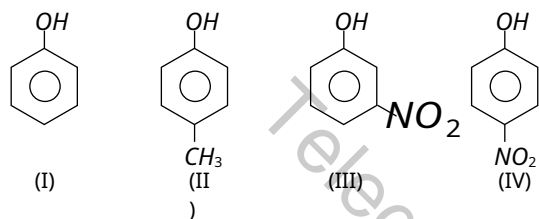


(d) All of these

10. The order of solubility of alkanols in water is

- (a) Propanol < Butanol > Pentanol
 (b) Propanol > Butanol > Pentanol
 (c) Propanol > Butanol < Pentanol
 (d) Propanol = Butanol = Pentanol

11. In the following compounds



The order of acidity is

[IIT-JEE 1996]

- (a) III > IV > I > II
 (b) I > IV > III > II
 (c) II > I > III > IV
 (d) IV > III > I > II

12. Butanal with dilute NaOH gives

[UPSEAT 2000]

- (a) $\text{CH}_3\text{CH}_2\text{CH}_2\overset{\text{OH}}{\underset{\text{H}}{\text{C}}}\text{CH}_2\text{CH}_2\text{CH}_2\text{CHO}$
 (b) $\text{CH}_3\text{CH}_2\text{CH}_2\overset{\text{O}}{\underset{\text{||}}{\text{C}}}\text{CH}_2\text{CH}_2\text{CH}_2\text{CHO}$
 (c) $\text{OHCCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CHO}$
 (d) $\text{CH}_3\text{CH}_2\text{CH}_2\overset{\text{OH}}{\underset{\text{H}}{\text{C}}}-\underset{\underset{\text{CH}_3}{\text{CH}_2}}{\text{CH}}\text{CHO}$

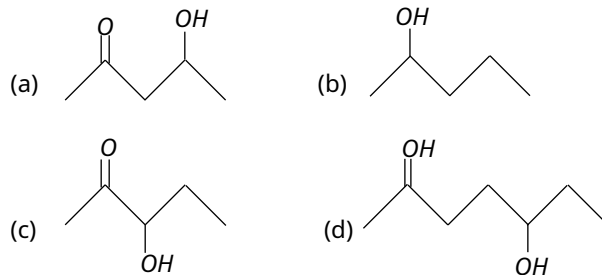
13. The correct order of the solubility of the different alcohols in water is

[Pune CET 1998]

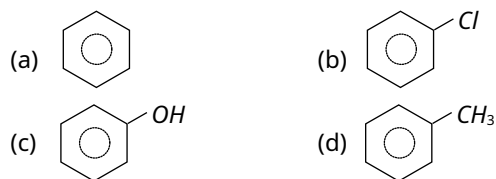
- (a) *n*-propyl alcohol > ethyl alcohol > *n*-butyl alcohol
 (b) Ethyl alcohol > *n*-butyl alcohol > *n*-propyl alcohol
 (c) *n*-butyl alcohol > *n*-propyl alcohol > ethyl alcohol

(d) Ethanol > *n*-propanol > *n*-butyl alcohol

14. Which one of the following will most readily be dehydrated in acidic condition [IIT-JEE (Screening) 2000]



15. Which of the following compounds will be most easily attacked by an electrophile [CBSE PMT 1998, 99]

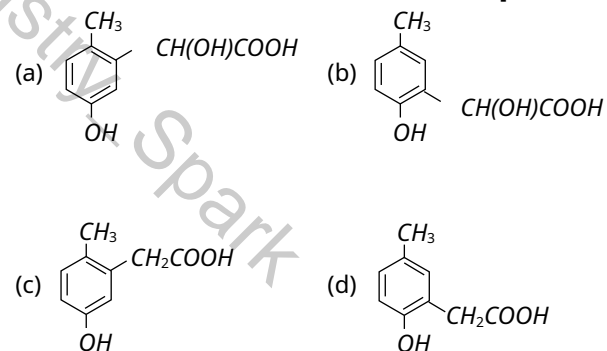


16. Fittig's reaction produces

- (a) Alkane
 (b) Alcohol
 (c) Diphenyl
 (d) Diethyl ether

17. *p*-cresol reacts with chloroform in alkaline medium to give the compound A which adds hydrogen cyanide to form, the compound B. The latter on acidic hydrolysis gives chiral carboxylic acid. The structure of the carboxylic acid is

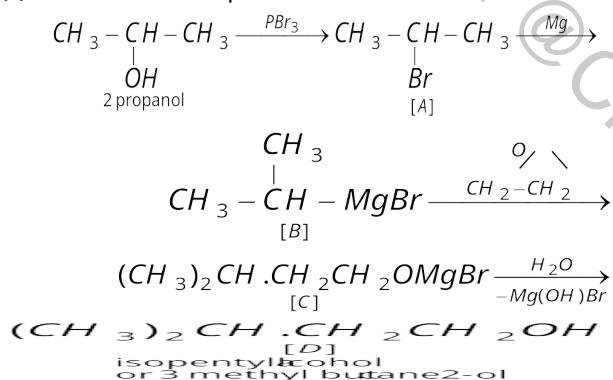
[AIEEE 2005]



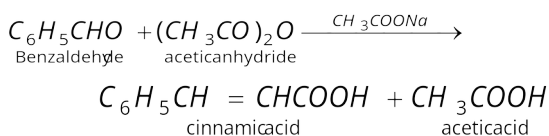
Answers and Solutions

(SET -26)

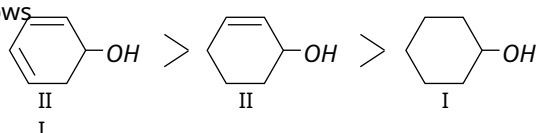
1. (c) The reaction sequence is as follows



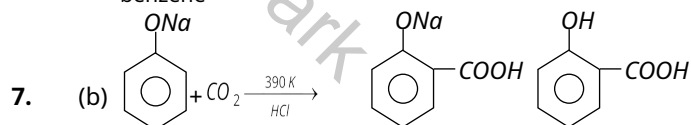
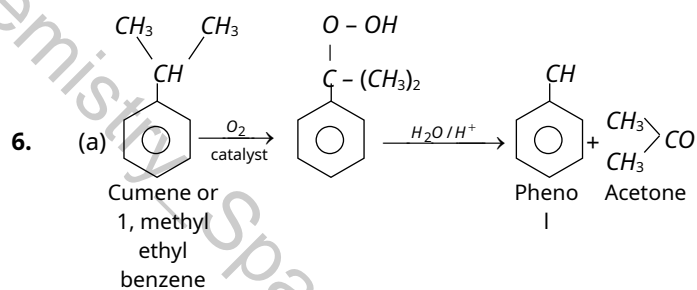
2. (d) Methoxy group due to +I effect increase electron density on OH - group, thus making it less acidic. Thus *o*-methoxy phenol and acetylene are less acidic than phenol, *p*-nitrophenol is more acidic than phenol
3. (b) Perkin reaction is the condensation reaction in which an aromatic aldehyde is heated with an anhydride of an aliphatic acid in presence of sodium salt of same acid to form α, β unsaturated acid.



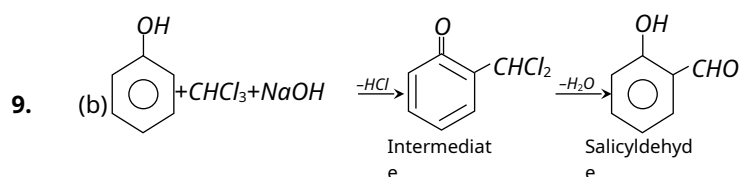
4. (b) The correct order of stability of carbocation is as follows



5. (b) PCl_5 is used in organic chemistry to replace the -OH group by -Cl and carbonylic oxygen by $(-\text{Cl})_2$.



7. (b) It is Kolbe's reaction.
8. (a) It is Lederer Manasse reaction.



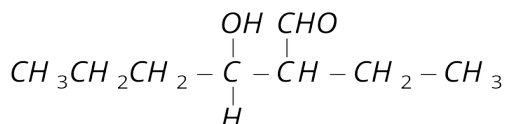
10. (b) Propanol > Butanol > Pentanol

The solubility of alcohols in water decreases as the molecular mass increases. As the size of alkyl group increases, hydrophobic character increases, Hence solubility decreases.

11. (d) IV > III > I > II.

$-\text{NO}_2$ group is electron withdrawing group while $-\text{CH}_3$ group is electron releasing group.

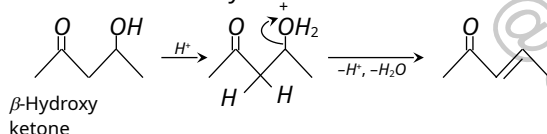
12. (d) $2\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CHO} + \text{dil. NaOH} \rightarrow$



13. (d) Ethanol > *n*-propanol > *n*-butyl alcohol

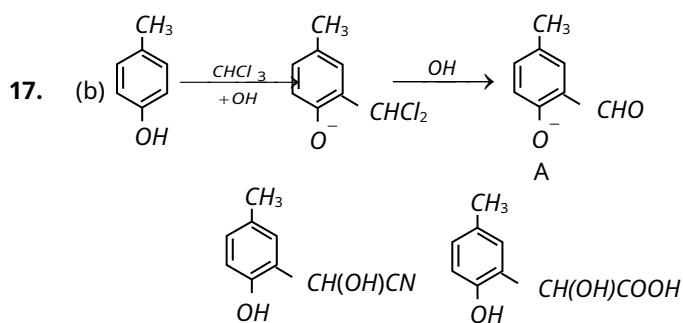
Solubility of alcohols in water decreases as the size of alkyl group increases because tendency to form hydrogen bonding decreases.

14. (a) Aldols (β -hydroxy aldehydes or β -hydroxy ketones) readily undergo dehydration to form α , β -unsaturated aldehydes or ketones.



15. (c) Phenol is most easily attacked by an electrophile because presence of $-\text{OH}$ group increases electron density at *o*- and *p*- positions.

16. (c) $2\text{C}_6\text{H}_5\text{Cl} + 2\text{Na} \xrightarrow[\text{ether}]{\text{Dry}} \text{C}_6\text{H}_5 - \text{C}_6\text{H}_5 + 2\text{NaCl}$
diphenyl



Aldehyde & Ketone

T Ordinary Thinking

Objective Questions

Introduction

1. Reaction of acetaldehyde with HCN followed by hydrolysis gives a compound which shows [MP PET 1997]
 - (a) Optical isomerism (b) Geometrical isomerism
 - (c) Metamerism (d) Tautomerism
2. In aldehydes and ketones, carbon of carbonyl group is [MP PMT 1995; RPET 1999, 2000]
 - (a) sp^3 hybridised (b) sp^2 hybridised
 - (c) sp hybridised (d) Unhybridised
3. The IUPAC name of the following structure is

$$\begin{array}{c} CH_3 \quad O \\ | \quad || \\ CH_3 - CH - C - CH_2 - CH_2OH \end{array}$$

 [MP PMT 1995]
 - (a) 1-hydroxy 4-methyl 3-pentanone
 - (b) 2-methyl 5-hydroxy 3-pentanone
 - (c) 4-methyl 3-oxo 1-pentanol
 - (d) Hexanol-1, one-3
4. Glyoxal is [BVP 2003]

$$\begin{array}{c} CH_2OH \\ | \\ CH_2O - CH_2O \end{array}$$

$$\begin{array}{c} CH_2OH \\ | \\ CH_2OH \end{array}$$

$$\begin{array}{c} CHO \\ | \\ CHO \end{array}$$

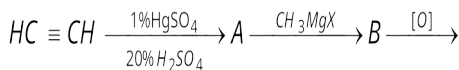
$$\begin{array}{c} CH_2OH \\ | \\ CHO \end{array}$$

 5. Aldehydes are isomeric with
 - (a) Ketones (b) Ethers
 - (c) Alcohols (d) Fatty acids
 6. Which of the following compounds does not contain an $-OH$ group [CPMT 1982]
 - (a) Phenol (b) Carboxylic acid
 - (c) Aldehydes (d) Alcohols
 7. IUPAC name of CH_3COCH_3 is [MP PET 1991]
 - (a) Acetone (b) 2-propanone
 - (c) Dimethyl ketone (d) Propanal
 8. What is the compound called if remaining two valencies of a carbonyl group are satisfied by two alkyl groups [CPMT 1990]
 - (a) Aldehyde (b) Ketone
 - (c) Acid (d) Acid chloride

9. $CH_3 - \overset{\overset{OH}{|}}{\underset{\underset{H}{|}}{C}} - CN$ is
 - (a) Acetaldehyde cyanohydrin
 - (b) Acetone cyanohydrin
 - (c) Cyanoethanol
 - (d) Ethanol nitrile
10. Ethanedial has which functional group(s)
 - (a) One ketonic (b) Two aldehydic
 - (c) One double bond (d) Two double bond
11. In the group $\begin{array}{c} R' \\ \diagup \\ C=O \\ \diagdown \\ R \end{array}$ the carbonyl carbon is joined to other atoms by
 - (a) Two sigma and one pi bonds
 - (b) Three sigma and one pi bonds
 - (c) One sigma and two pi bonds
 - (d) Two sigma and two pi bonds
12. Which of the following types of isomerism is shown by pentanone [MP PMT 1995]
 - (a) Chain isomerism (b) Position isomerism
 - (c) Functional isomerism (d) All of these
13. IUPAC name of CCl_3CHO is [MP PMT/PET 1988]
 - (a) Chloral (b) Trichloro acetaldehyde
 - (c) 1, 1, 1-trichloroethanal (d) 2, 2, 2-trichloroethanal
14. Which of the following is a mixed ketone [AFMC 1997]
 - (a) Pentanone (b) Acetophenone
 - (c) Benzophenone (d) Butanone
15. Chloral is [CPMT 1976, 84]
 - (a) CCl_3CHO (b) CCl_3COCH_3
 - (c) CCl_3COCCl_3 (d) CCl_3CH_2OH
16. Carbonyl compounds are usually
 - (a) Ethers, aldehydes, ketones and carboxylic acids
 - (b) Aldehydes, ketones and carboxylic acids
 - (c) Aldehydes and ketones
 - (d) Carboxylic acids
17. Acetone and acetaldehyde are [KCET 1998]
 - (a) Position isomers (b) Functional isomers
 - (c) Not isomers (d) Chain isomers
18. Which of the aldehyde is most reactive? [DCE 2004]
 - (a) $C_6H_5 - CHO$ (b) CH_3CHO
 - (c) $HCHO$ (d) All the equally reactive

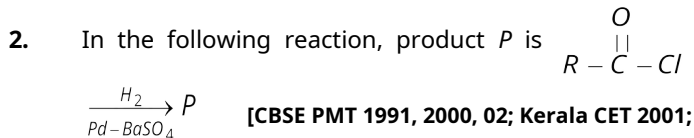
Preparation

1. The end product in the following sequence of reaction is



[Bihar CEE 2002]

- (a) Acetic acid (b) Isopropyl alcohol
(c) Acetone (d) Ethanol



- (a) RCH_2OH (b) $RCOOH$
(c) $RCHO$ (d) RCH_3

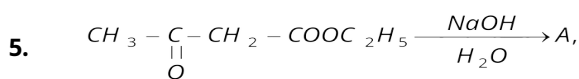
3. Acetophenone is prepared from [CPMT 2003]

- (a) Rosenmund reaction
(b) Sandmeyer reaction
(c) Wurtz reaction
(d) Friedel craft reaction

4. Compound which gives acetone on ozonolysis

[UPSEAT 2003]

- (a) $CH_3 - CH = CH - CH_3$ (b) $(CH_3)_2C = C(CH_3)_2$
(c) $C_6H_5CH = CH_2$ (d) $CH_3CH = CH_2$



product 'A' in the reaction is [RPMT 2003]

- (a) CH_3COOH (b) C_2H_5OH
(c) CH_3COCH_3 (d) C_2H_5CHO

6. Which one of the following compounds is prepared in the laboratory from benzene by a substitution reaction

[EAMCET 2003]

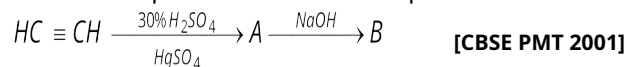
- (a) Glyoxal (b) Cyclohexane
(c) Acetophenone (d) Hexabromo cyclohexane

7. Ketones $(R - \overset{\overset{O}{||}}{C} - R_1)$ where $R = R_1 = \text{alkyl group}$.

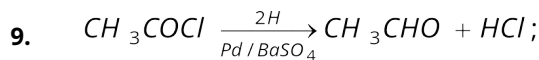
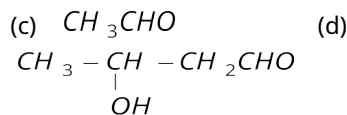
It can be obtained in one step by [CBSE PMT 1997]

- (a) Hydrolysis of esters
(b) Oxidation of primary alcohol
(c) Oxidation of secondary alcohol
(d) Reaction of acid halide with alcohols

8. Predict the product 'B' in the sequence of reaction



- (a) CH_3COONa (b) CH_3COOH



The above reaction is called

[JIPMER 1997]

- (a) Reimer-Tiemann reaction (b) Cannizzaro reaction
(c) Rosenmund reaction (d) Reformatsky reaction

10. The oxidation of toluene to benzaldehyde by chromyl chloride is called

[CBSE PMT 1996; AFMC 1998, 99; AIIMS 2000;

JIPMER 2001; AFMC 2001; DCE 2004]

- (a) Cannizzaro reaction (b) Wurtz reaction
(c) Etard reaction (d) Reimer-Tiemann

reaction

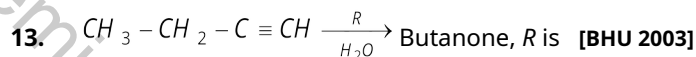
11. From which of the following tertiary butyl alcohol is obtained by the action of methyl magnesium iodide

[MP CET 2000]

- (a) $HCHO$ (b) CH_3CHO
(c) CH_3COCH_3 (d) CO_2

12. Catalyst used in Rosenmund reduction is [Bihar MEE 1997]

- (a) $Pd / BaSO_4$ (b) $Zn-Hg$ couple
(c) $LiAlH_4$ (d) Ni / H_2



- (a) Hg^{++} (b) $KMnO_4$
(c) $KClO_3$ (d) $K_2Cr_2O_7$

14. Dry heating of calcium acetate gives

[DPMT 1979, 81, 96; NCERT 1981; KCET 1993;

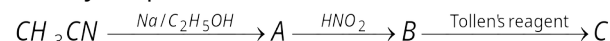
Bihar CEE 1995; MNR 1986; MP PMT 1997;

MP PET 1993, 95; JIPMER 2002; AIIMS 1996;

CPMT 1982, 86, 96, 2003; RPMT 2002]

- (a) Acetaldehyde (b) Ethane
(c) Acetic acid (d) Acetone

15. Identify the product C in the series



[MP PET 1999]

- (a) CH_3COOH (b) CH_3CH_2NHOH
(c) CH_3CONH_2 (d) CH_3CHO

16. Acetophenone is prepared by the reaction of which of the following in the presence of $AlCl_3$ catalyst [AIIMS 1996]

- (a) Phenol and acetic acid
(b) Benzene and acetone
(c) Benzene and acetyl chloride

- (d) Phenol and acetone
17. Isopropyl alcohol on oxidation gives
[RPMT 1997; BHU 1997]
(a) Acetone (b) Acetaldehyde
(c) Ether (d) Ethylene
18. On heating calcium acetate and calcium formate, the product formed is
[DPMT 1984; EAMCET 1985; MP PMT 1996, 92; KCET 1990; CPMT 1979, 82, 84; BIT 1992; RPET 2000]
(a) CH_3COCH_3 (b) CH_3CHO
(c) $HCHO + CaCO_3$ (d) $CH_3CHO + CaCO_3$
19. Which of the following compound gives a ketone with Grignard reagent [CPMT 1988; MP PET 1997]
(a) Formaldehyde (b) Ethyl alcohol
(c) Methyl cyanide (d) Methyl iodide
20. In the Rosenmund's reduction, $BaSO_4$ taken with catalyst Pd acts as
(a) Promotor (b) Catalytic poison
(c) Cooperator (d) Absorber
21. The Clemmenson reduction of acetone yields
(a) Ethanol (b) Ethanal
(c) Propane (d) Propanol
22. Catalyst $SnCl_2 / HCl$ is used in [BHU 1995]
(a) Stephen's reduction
(b) Cannizzaro reaction
(c) Clemmensen's reduction
(d) Rosenmund's reduction
23. Methyl ethyl ketone is prepared by the oxidation of [IIT-JEE 1987; MP PMT 1992]
(a) 2-propanol (b) 1-butanol
(c) 2-butanol (d) *t*-butyl alcohol
24. Benzaldehyde can be prepared by oxidation of toluene by [BHU 1986]
(a) Acidic $KMnO_4$ (b) $K_2Cr_2O_7$
(c) CrO_2Cl_2 (d) All of these
25. $C_6H_6 + CO + HCl \xrightarrow{\text{Anhy } AlCl_3} X + HCl$
Compound X is [DPMT 1979, 83]
(a) $C_6H_5CH_3$ (b) $C_6H_5CH_2Cl$
(c) C_6H_5CHO (d) C_6H_5COOH
26. Which of the following gases when passed through warm dilute solution of H_2SO_4 in presence of $HgSO_4$ gives acetaldehyde [EAMCET 1986]
(a) CH_4 (b) C_2H_6
(c) C_2H_4 (d) C_2H_2
27. CH_3COCH_3 can be obtained by [CBSE PMT 1992]
(a) Heating acetaldehyde with methanol
(b) Oxidation of propyl alcohol
(c) Oxidation of isopropyl alcohol
(d) Reduction of propionic acid
28. Propyne on hydrolysis in presence of HCl and $HgSO_4$ gives [DPMT 1980; CPMT 1983]
(a) Acetaldehyde (b) Acetone
(c) Formaldehyde (d) None of these
29. Which of the following on reaction with NH_3 gives urinary antiseptic compound [MP PMT 1999]
(a) $HCHO$ (b) CH_3CHO
(c) C_6H_5CHO (d) $C_6H_5CH_2CHO$
30. The oxidation product of 2-propanol with hot conc. HNO_3 is [JIPMER 1997]
(a) Ethanoic acid (b) Propanone
(c) Propanal (d) None of these
31. Hydrolysis of ozonide of 1-butene gives [Kerala PMT 2003]
(a) Ethylene only
(b) Acetaldehyde and Formaldehyde
(c) Propionaldehyde and Formaldehyde
(d) Acetaldehyde only
(e) Acetaldehyde and Oxalic acid
32. Ketones are prepared by
(a) Clemmensen's reduction (b) Cannizzaro reaction
(c) Rosenmund's reduction (d) Oppenauer's oxidation
33. O_3 reacts with $CH_2=CH_2$ to form ozonide. On hydrolysis it forms [MP PET 1986, 90]
(a) Ethylene oxide (b) $HCHO$
(c) Ethylene glycol (d) Ethyl alcohol
34. Ethyne on reaction with water in the presence of $HgSO_4$ and H_2SO_4 gives [UPSEAT 1999; BVP 2003]
(a) Acetone (b) Acetaldehyde
(c) Acetic acid (d) Ethyl alcohol
35. $CH_3-CH_2-C \equiv CH \xrightarrow[H_2SO_4]{HgSO_4} A$, the compound A is [Orissa JEE 2004]
(a) $CH_3-CH_2-\overset{\overset{O}{||}}{C}-CH_3$
(b) $CH_3-CH_2-CH_2-CHO$
(c) $CH_3-CH_2-CH_2-COOH$
(d) None of these

36. When a mixture of methane and oxygen is passed through heated molybdenum oxide, the main product formed is

[KCET 2004]

- (a) Methanoic acid (b) Ethanal
(c) Methanol (d) Methanal

37. Benzoin is [KCET 2004]

- (a) Compound containing an aldehyde and a ketonic group
(b) α, β -unsaturated acid
(c) α -hydroxy aldehyde
(d) α -hydroxy ketone

38. The oxidation of benzyl chloride with lead nitrate gives [MP PMT 2004]

- (a) Benzyl alcohol (b) Benzoic acid
(c) Benzaldehyde (d) *p*-chlorobenzaldehyde

39. $R-CH=CH_2 + CO + H_2 \xrightarrow[\text{High Pressure}]{\text{High Temp}} RCH_2CH_2CHO$. [DPMT 2004]

The above reaction is

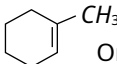
- (a) Mendius reaction (b) Oxo process
(c) Sandorn's reaction (d) Stephen's reaction

40. Glycerol reacts with potassium bisulphate to produce [Pb. CET 2003]

- (a) Allyl iodide (b) Allyl sulphate
(c) Acryl aldehyde (d) Glycerol trisulphate

41. The reagent used in Gatterman Koch aldehyde synthesis is [CPMT 2004]

- (a) $Pb / BaSO_4$ (b) alkaline $KMnO_4$
(c) acidic $KMnO_4$ (d) $CO + HCl$

42.  On reductive ozonolysis yields [Orissa JEE 2005]

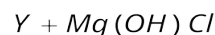
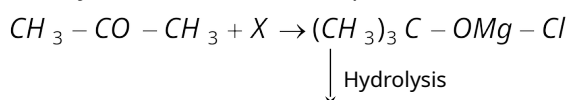
- (a) 6-oxoheptanal (b) 6-oxoheptanoic acid
(c) 6-hydroxyheptanal (d) 3-hydroxypentanal

43. An alkene of molecular formula C_9H_{18} on ozonolysis gives 2,2 dimethyl propanal & 2-butanone, then the alkene is [Kerala CET 2005]

- (a) 2, 2, 4-trimethyl -3-hexene
(b) 2, 2, 6-trimethyl-3-hexene
(c) 2, 3, 4-trimethyl-2-hexene
(d) 2, 2, 4-trimethyl-2-hexene
(e) 2, 2dimethyl-2-heptene

Properties

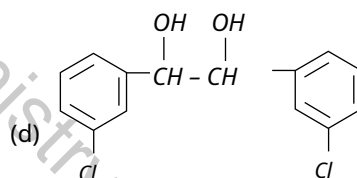
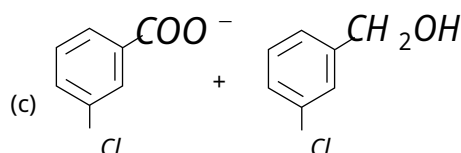
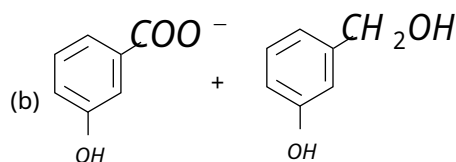
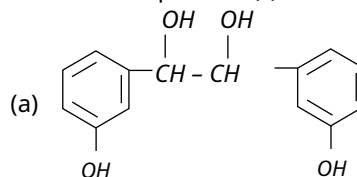
1. Identify the reactant X and the product Y



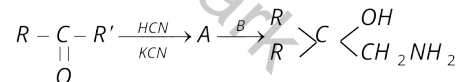
[Kerala PMT 2003]

- (a) $X = MgCl_2$; $Y = CH_3CH=CH_2$
(b) $X = CH_3MgCl$; $Y = C_2H_5COCH_3$
(c) $X = CH_3MgCl$; $Y = (CH_3)_3C-OH$
(d) $X = C_2H_5MgCl$; $Y = (CH_3)_3C-OH$

2. When *m*-chlorobenzaldehyde is treated with 50% KOH solution, the product (s) obtained is (are) [CBSE PMT 2003]



3. A and B in the following reactions are [CBSE PMT 2003]

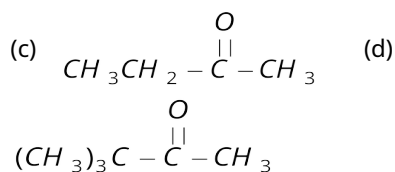


- (a) $A = RR' \begin{matrix} \text{CN} \\ | \\ \text{OH} \end{matrix}$, $B = LiAlH_4$
(b) $A = RR' \begin{matrix} \text{OH} \\ | \\ \text{COOH} \end{matrix}$, $B = NH_3$
(c) $A = RR' \begin{matrix} \text{CN} \\ | \\ \text{OH} \end{matrix}$, $B = H_3O^+$
(d) $A = RR'CH_2CN$, $B = NaOH$

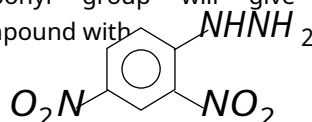
4. Reduction of Aldehydes and Ketones to hydrocarbon take place in the presence of [CPMT 2003]

- (a) Zn amalgam and HCl acid
(b) $Pd / BaSO_4$
(c) Anhydrous $AlCl_3$

- (d) Ni/Pt
5. Reduction of $>C=O$ to CH_2 can be carried out with [DCE 2000]
 (a) Catalytic reduction (b) Na/C_2H_5OH
 (c) Wolf-Kischner reduction (d) $LiAlH_4$
6. For C_6H_5CHO which of the following is incorrect [CPMT 1985]
 (a) On oxidation it yields benzoic acid
 (b) It is used in perfumery
 (c) It is an aromatic aldehyde
 (d) On reduction yields phenol
7. Grignard reagent on reaction with acetone forms [BHU 1995; RPMT 2002; Roorkee 1990]
 (a) Tertiary alcohol (b) Secondary alcohol
 (c) Acetic acid (d) Acetaldehyde
8. Which of the following is incorrect [CBSE PMT 2001]
 (a) $FeCl_3$ is used in the detection of phenols
 (b) Fehling solution is used in the detection of glucose
 (c) Tollen's reagent is used in detection of unsaturation
 (d) $NaHSO_3$ is used in the detection of carbonyl compounds
9. Consider the following statement Acetophenone can be prepared by
 (1) Oxidation of 1-phenylethanol
 (2) Reaction of benzaldehyde with methyl magnesium bromide
 (3) Friedel craft's reaction of benzene with acetyl chloride
 (4) Distillation of calcium benzoate [SCRA 2001]
 (a) 1 and 2 (b) 1 and 4
 (c) 1 and 3 (d) 3 and 4
10. Which one of the following pairs is not correctly matched [SCRA 2001]
 (a) $>C=O \xrightarrow{\text{Clemenson's reduction}} >CH_2$
 (b) $>C=O \xrightarrow{\text{Wolf-Kishner reduction}} >CHOH$
 (c) $-COCl \xrightarrow{\text{Rosenmund's reduction}} CHO$
 (d) $-C \equiv N \xrightarrow{\text{Stephens reduction}} CHO$
11. Which of the following gives aldol condensation reaction [CPMT 2001]
 (a) C_6H_5OH (b) $C_6H_5-C(=O)-C_6H_5$



12. Which of the following products is formed when benzaldehyde is treated with CH_3MgBr and the addition product so obtained is subjected to acid hydrolysis [Haryana CEET 2000]
 (a) Secondary alcohol (b) A primary alcohol
 (c) Phenol (d) Tert-Butyl alcohol
13. Aldol condensation will not be observed in [GATE 2001]
 (a) Chloral (b) Phenyl acetaldehyde
 (c) Hexanal (d) Ethanol
14. Which of the following compounds containing carbonyl group will give coloured crystalline compound with $NHNH_2$



- [Kerala (Med.) 2001]
 (a) CH_3COCl (b) CH_3COCH_3
 (c) $CH_3CO(OC_2H_5)$ (d) CH_3CONH_2
 (e) $HO(C_6H_4)COOH$
15. Which of the following organic compounds exhibits positive Fehling test as well as iodoform test [MP PET 1994; KCET 2001]
 (a) Methanal (b) Ethanol
 (c) Propanone (d) Ethanal
16. Which of the following compound will undergo self aldol condensation in the presence of cold dilute alkali [CBSE PMT 1994]
 (a) C_6H_5CHO (b) CH_3CH_2CHO
 (c) $CH \equiv C-CHO$ (d) $CH_2=CH-CHO$
17. Acetaldehyde when treated with dilute $NaOH$ gives [EAMCET 1998]
 (a) CH_3CH_2OH
 (b) CH_3COOH
 (c) $CH_3-CH(OH)-CH_2-CHO$
 (d) CH_3-CH_3

18. C_2H_5CHO and $(CH_3)_2CO$ can be distinguished by testing with

[EAMCET 1998; CPMT 1994, 97; MP PET 1995;

MP PMT 1996; RPMT 1997, 99]

- (a) Phenyl hydrazine (b) Hydroxylamine
(c) Fehling solution (d) Sodium bisulphite

19. Which of the following will undergo aldol condensation

[IIT 1998]

- (a) Acetaldehyde (b) Propanaldehyde
(c) Benzaldehyde (d) Trideuteroacetaldehyde

20. Which of the following oxidation reactions can be carried out with chromic acid in aqueous acetone at $5-10^\circ C$

[Roorkee Qualifying 1998]

- (a) $CH_3(CH_2)_3C \equiv C - CH - CH_3 \rightarrow$
 OH (b) $CH_3(CH_2)_3CH = CH - CH_2OH \rightarrow$



- (c) $C_6H_5CH_3 \rightarrow C_6H_5COOH$
(d) $CH_3(CH_2)_3CH_2OH \rightarrow CH_3(CH_2)_3CHO$

21. Acetaldehyde cannot show [AIIMS 1997]

- (a) Iodoform test (b) Lucas test
(c) Benedict's test (d) Tollen's test

22. Benzaldehyde + NaOH \rightarrow

[CPMT 1997, 2001; CBSE PMT 1999; Pb. PMT 1999]

- (a) Benzyl alcohol (b) Benzoic alcohol
(c) Hydrobenzamide (d) Cinnamic acid

23. The following reagent converts C_6H_5COCHO to $C_6H_5CHOHCOONa$ [Roorkee Qualifying 1998]

- (a) Aq. NaOH (b) Acidic $Na_2S_2O_3$
(c) Na_2CrO_4 / H_2SO_4 (d) $NaNO_2 / HCl$

24. Benzyl alcohol and sodium benzoate is obtained by the action of sodium hydroxide on benzaldehyde. This reaction is known as [KCET 2005]

- (a) Perkin's reaction (b) Cannizzaro's reaction
(c) Sandmeyer's reaction (d) Claisen condensation

25. To distinguish between formaldehyde and acetaldehyde, we require [Orissa PMT 1987]

- (a) Tollen's reagent (b) Fehling's solution
(c) Schiff's reagent (d) Caustic soda solution

26. Which of the following does not give iodoform test

[AIIMS 1992; MP PMT 1990, 96; CET Pune 1998

DPMT 1981; CPMT 1976]

- (a) CH_3CH_2OH (b) CH_3OH
(c) CH_3CHO (d) $PhCOCH_3$

27. Which of the following will not give iodoform test

[Kurukshetra CEE 1991; Bihar CEE 1995;

CBSE PMT 1998; MP PMT 2004]

- (a) Ethanal (b) Ethanol
(c) 2-propanone (d) 3-pentanone

28. Which of the following will not give the iodoform test

[MNR 1994]

- (a) Acetophenone (b) Ethanal
(c) Benzophenone (d) Ethanol

29. Haloform test is given by the following substance

[EAMCET 1988]

- (a) $HCHO$ (b) $(CH_3)_2CO$
(c) CH_3OCH_3 (d) CH_3CH_2Cl

30. Dimethyl ketones are usually characterised through

[MNR 1992]

- (a) Tollen's reagent (b) Iodoform test
(c) Schiff's test (d) Benedict's reagent

31. The light yellow compound produced when acetone reacts with iodine and alkali, is [MP PMT 1992; EAMCET 1993]

- (a) $CH_3.CO.CH_2I$ (b) CH_3I
(c) CHI_3 (d) None of these

32. If formaldehyde and KOH are heated, then we get

[MP PET 1999; KCET 2000]

- (a) Acetylene (b) Methane
(c) Methyl alcohol (d) Ethyl formate

33. Which of the following reagent reacts differently with $HCHO$, CH_3CHO and CH_3COCH_3 [MP PET 1999]

- (a) HCN (b) NH_2NH_2
(c) NH_2OH (d) NH_3

34. Acetaldehyde reacts with C_2H_5MgCl the final product is

[Pb. CET 1985]

- (a) An aldehyde (b) A ketone
(c) A primary alcohol (d) A secondary alcohol

35. Treatment of propionaldehyde with dilute NaOH solution gives [MNR 1992]

- (a) $CH_3CH_2COOCH_2CH_2CH_3$
(b) $CH_3CH_2CHOHCH(CH_3)CHO$
(c) $CH_3CH_2CHOHCH_2CH_2CHO$
(d) $CH_3CH_2COCH_2CH_2CHO$

36. Aldol condensation of acetaldehyde involves the formation of which of the following intermediate [Pb. CET 1986]
 (a) Acetate ion (b) A carbanion
 (c) A carbonium ion (d) A free radical
37. $3CH_3COCH_3 \xrightarrow{HCl} (CH_3)_2C=CH-CO-CH_2-C(CH_3)_2$
 This polymer (B) is obtained when acetone is saturated with hydrogen chloride gas, B can be [CBSE PMT 1989]
 (a) Phorone (b) Formose
 (c) Diacetone alcohol (d) Mesityl oxide
38. Aromatic aldehydes undergo disproportionation in presence of sodium or potassium hydroxide to give corresponding alcohol and acid. The reaction is known as [MNR 1987]
 (a) Wurtz's reaction (b) Cannizzaro reaction
 (c) Friedel-Craft's reaction (d) Claisen reaction
39. *m*-chlorobenzaldehyde on reaction with conc. KOH at room temperature gives [IIT-JEE 1991]
 (a) Potassium *m*-chlorobenzoate and *m*-hydroxy benzaldehyde
 (b) *m*-hydroxy benzaldehyde and *m*-chlorobenzyl alcohol
 (c) *m*-chlorobenzyl alcohol and *m*-hydroxy benzyl alcohol
 (d) Potassium *m*-chlorobenzoate and *m*-chlorobenzyl alcohol
40. Which of the following does not give yellow precipitate with NaOH + KI [MP PMT 1997]
 (a) Acetone (b) Acetaldehyde
 (c) Benzaldehyde (d) Acetophenone
41. The alkaline $CuSO_4$ containing sodium potassium tartrate does not react with [MP PMT 1997]
 (a) CH_3CHO (b) C_2H_5CHO
 (c) $C_6H_5CH_2CHO$ (d) C_6H_5CHO
42. Correct order of reactivity of CH_3CHO , $C_2H_5COCH_3$ and CH_3COCH_3 is [MP PMT 1991]
 (a) $CH_3CHO > CH_3COCH_3 > CH_3COC_2H_5$
 (b) $C_2H_5COCH_3 > CH_3COCH_3 > CH_3CHO$
 (c) $CH_3COCH_3 > CH_3CHO > C_2H_5COCH_3$
 (d) $CH_3COCH_3 > C_2H_5COCH_3 > CH_3CHO$
43. One mole of an organic compound requires 0.5 mole of oxygen to produce an acid. The compound may be [NCERT 1981]
 (a) Alcohol (b) Ether
 (c) Ketone (d) Aldehyde
44. Aldehydes can be oxidised by [NCERT 1983]
 (a) Tollen's reagent (b) Fehling solution
 (c) Benedict solution (d) All of these
45. Silver mirror is a test for [DPMT 1983; CBSE PMT 1988]
 (a) Aldehydes (b) Thio alcohols
 (c) Amines (d) Ethers
46. $CH_3CH=CHCHO$ is oxidised to $CH_3CH=CHCOOH$ using [NCERT 1978]
 (a) Alkaline $KMnO_4$ (b) Selenium dioxide
 (c) Ammoniacal $AgNO_3$ (d) All of these
47. Which of the following does not turn Schiff's reagent to pink [DPMT 1981; CPMT 1989]
 (a) Formaldehyde (b) Benzaldehyde
 (c) Acetone (d) Acetaldehyde
48. Fehling's test is positive for [KCET 1993]
 (a) Acetaldehyde (b) Benzaldehyde
 (c) Ether (d) Alcohol
49. Acetaldehyde and acetone differ in their reaction with [KCET 1989]
 (a) Sodium bisulphite
 (b) Ammonia
 (c) Phosphorus pentachloride
 (d) Phenyl hydrazine
50. The final product formed when acetaldehyde is reduced with sodium and alcohol is [BHU 1976]
 (a) Ethylene (b) Ethyl alcohol
 (c) Ethene (d) All of these
51. The compound obtained by the reduction of propionaldehyde by amalgamated zinc and concentrated HCl is [MP PMT 1983]
 (a) Propanol (b) Propane
 (c) Propene (d) All of these
52. Formaldehyde when treated with KOH gives methanol and potassium formate. The reaction is known as [MP PET 1997]
 (a) Perkin reaction (b) Claisen reaction
 (c) Cannizzaro reaction (d) Knoevenagel reaction
53. Aldehydes and ketones give addition reaction with [KCET 1992]
 (a) Hydrazine (b) Phenyl hydrazine
 (c) Semicarbazide (d) Hydrogen cyanide
 (e) All of these
54. Acetaldehyde reacts with [CBSE PMT 1991]
 (a) Electrophiles only
 (b) Nucleophiles only
 (c) Free radicals only
 (d) Both electrophiles and nucleophiles
55. The typical reactions of aldehyde is [Pb. CET 1986]

(a) Electrophilic addition (b) Nucleophilic substitution

(c) Nucleophilic addition (d) Nucleophilic elimination

56. Which will not give acetamide on reaction with ammonia

[CPMT 1985]

- (a) Acetic acid (b) Acetyl chloride
(c) Acetic anhydride (d) Methyl formate

57. The addition of HCN to carbonyl compounds is an example of

[Haryana CEET 2000]

- (a) Nucleophilic substitution
(b) Electrophilic addition
(c) Nucleophilic addition
(d) Electrophilic substitution

58. Which of the following reagents is used to distinguish acetone and acetophenone

[RPMT 2002; KCET 1998]

- (a) $NaHSO_3$ (b) Grignard reagent
(c) Na_2SO_4 (d) NH_4Cl

59. The product formed by the reaction of chlorine with benzaldehyde in the absence of a catalyst is

[Tamil Nadu CET 2002]

- (a) Chlorobenzene (b) Benzyl chloride
(c) Benzoyl Chloride (d) o-Chlorobenzaldehyde

60. Which of the following compound is resistant to nucleophilic attack by hydroxyl ions

[CBSE PMT 1998; KCET (Med.) 2001; AFMC 2001]

- (a) Methyl acetate (b) Acetonitrile
(c) Dimethyl ether (d) Acetamide

61. Glucose molecule reacts with X number of molecules of phenylhydrazine to yield osazone. The value of X is

[CBSE PMT 1998]

- (a) One (b) Two
(c) Three (d) Four

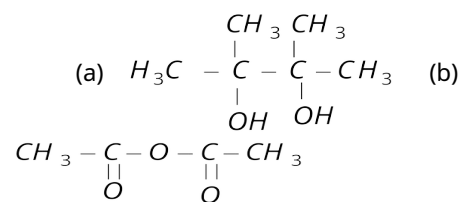
62. In which of the following reactions aromatic aldehyde is treated with acid anhydride in presence of corresponding salt of the acid to give unsaturated aromatic acid

[BHU 1998, KCET (Med.) 2001]

- (a) Friedel-Craft's reaction (b) Perkin reaction
(c) Wurtz reaction (d) None of these

63. $2CH_3 - \overset{\overset{O}{||}}{C} - CH_3 \xrightarrow[H^+]{Mg/Hg}$ Product, product in the reaction is

[RPMT 2003]



(c) $CH_3 - \overset{\overset{OH}{|}}{CH} - \overset{\overset{OH}{|}}{CH} - CH_3$ (d) None of these

64. Cinnamic acid is formed when $C_6H_5 - CHO$ condenses with $(CH_3CO)_2O$ in presence of [Orissa JEE 2003]

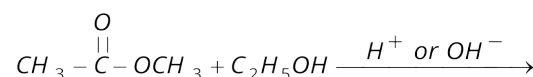
- (a) Conc. H_2SO_4 (b) Sodium acetate
(c) Sodium metal (d) Anhydrous $ZnCl_2$

65. A mixture of benzaldehyde and formaldehyde on heating with aqueous $NaOH$ solution gives

[IIT-JEE (Screening) 2001]

- (a) Benzyl alcohol and sodium formate
(b) Sodium benzoate and methyl alcohol
(c) Sodium benzoate and sodium formate
(d) Benzyl alcohol and methyl alcohol

66. The reaction,



$CH_3 - \overset{\overset{O}{||}}{C} - OC_2H_5 + CH_3OH$ is called [MP PMT 2003]

(a) Perkin's reaction (b) Claisen reaction (c) Esterification (d) Trans-esterification

67. Formaldehyde reacts with ammonia to give urotropine. The formula of urotropine is

[MP PMT 1989, 96, 2003; AIIMS 1982; NCERT 1987; MP PET 1990, 91, 2000; CPMT 1978, 82, 86, 97; KCET 2003]

- (a) $(CH_2)_6 N_4$ (b) $(CH_2)_4 N_3$
(c) $(CH_2)_6 N_6$ (d) $(CH_2)_3 N_3$

68. Aldol condensation will not take place in

[CBSE PMT 1996, 99; RPMT 1999; CPMT 1988, 04]

- (a) $HCHO$ (b) CH_3CH_2CHO
(c) CH_3CHO (d) CH_3COCH_3

69. Contents of three bottles were found to react

(i) Neither with Fehling's solution nor with Tollen's reagent

(ii) Only with Tollen's reagent but not with Fehling's solution

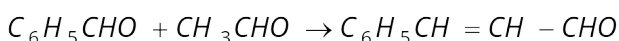
(iii) With both Tollen's reagent and Fehling's solution.

If they contained either ethanal (acetaldehyde) or propanone (acetone) or benzal (benzaldehyde), which bottle contained which

- (a) In (i) benzal, in (ii) ethanal and in (iii) propanone
(b) In (i) benzal, in (ii) propanone and in (iii) ethanal
(c) In (i) propanone, in (ii) benzal and in (iii) ethanal
(d) In (i) propanone, in (ii) ethanal and in (iii) benzal

70. Action of hydrazine on aldehydes and ketones gives compound of the general structure

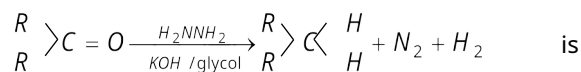
- (a) $>C=N-NH_2$
 (b) $>C=N-OH$
 (c) $>C=N-NH-CONH_2$
 (d) $>C=N-NH-C_6H_5$
71. The reaction in which sodium cyanide is used
 [MP PET/PMT 1998]
 (a) Perkin reaction (b) Reimer-Tiemann reaction
 (c) Benzoin condensation (d) Rosenmund reaction
72. Which one of the following reactions is a method for the conversion of a ketone into a hydrocarbon
 [MP PET/PMT 1998; CBSE PMT 1989]
 (a) Aldol condensation (b) Reimer-Tiemann reaction
 (c) Cannizzaro reaction (d) Wolf-Kishner reduction
73. Bakelite is a polymer of [DPMT 1996; MP PET 2002]
 (a) $HCHO$ + phenol
 (b) $HCHO$ + aldehyde (acetaldehyde)
 (c) Phenol + H_2SO_4
 (d) $HCHO$ + acetone
74. Clemmenson reduction involves $>C=O$ to $>CH_2$ in presence of [DPMT 1996]
 (a) Zn/Hg (b) Alcohol
 (c) Zn dust (d) Zn / alcohol
75. Aldol condensation involving $CH_3CHO + CH_3CHO$ gives the product [DPMT 1996]
 (a) $CH_3CHOHCH_2CHO$ (b) $CH_3COCH_2CH_3$
 (c) $CH_3CH=CH_2$ (d) None of these
76. Enol content is highest in [Orissa JEE 2005]
 (a) Acetone (b) Acetophenone
 (c) Acetic acid (d) Acetyl acetone
77. Which one of the following reacts with HCN and Tollen's reagent, but is not oxidised by Fehling's solution
 (a) Methanal (b) Ethanal
 (c) Benzaldehyde (d) Acetone
78. During reaction of benzaldehyde with alkali one of the product is
 (a) Phenol (b) Benzyl alcohol
 (c) Benzene (d) Benzophenone
79. Cannizzaro reaction is given by [DPMT 1996]
 (a) $HCHO$ (b) CH_3COCH_3
 (c) CH_3CHO (d) CH_3CH_2OH
80. The reaction



is known as [BHU 1996]

- (a) Perkin's reaction (b) Claisen condensation
 (c) Benzoin condensation (d) Cannizzaro's reaction
81. When two molecules of acetaldehyde condense in the presence of dilute alkali, it forms [Bihar MEE 1996]
 (a) Acetal (b) Sodium formate
 (c) Aldol (d) Mesitylene
 (e) None of these
82. Acetaldehyde on treatment with dil. $NaOH$ followed by heating gives [CET Pune 1998]
 (a) $CH_3CH_2CH_2CH_2OH$
 (b) $CH_3CH_2CH_2CHO$
 (c) $CH_3-CH=CHCHO$
 (d) $CH_3-CH=CHCH_2OH$
83. Reaction $\begin{matrix} R \\ \diagup \\ CO \\ \diagdown \\ R \end{matrix} + HCN \rightarrow R - \begin{matrix} R \\ | \\ C \\ | \\ CN \end{matrix} - OH$ is [Kurukshetra CEE 1998; IIT 1990]
 (a) Electrophilic substitution
 (b) Electrophilic addition
 (c) Nucleophilic addition
 (d) Nucleophilic substitution
84. Benzaldehyde on reaction with acetophenone in the presence of sodium hydroxide solution gives [BVP 2003]
 (a) $C_6H_5CH=CHCOC_6H_5$
 (b) $C_6H_5COCH_2C_6H_5$
 (c) $C_6H_5CH=CHC_6H_5$
 (d) $C_6H_5CH(OH)COC_6H_5$
85. Aldehydes and ketones can be reduced to hydrocarbon by using [Orissa JEE 2003]
 (a) $LiAlH_4$ (b) $H_2/Pd-BaSO_4$
 (c) $Na-Hg/HCl$ (d) NH_2-NH_2/C_2H_5ONa
86. An important reaction of acetone is autocondensation in presence of concentrated sulphuric acid to give the aromatic compound [KCET 2003; MP PET 1986, 89; MP PMT 1992, 2000]
 (a) Mesitylene (b) Mesityl oxide
 (c) Trioxan (d) Phorone
87. Identify the organic compound which, on heating with strong solution of $NaOH$, partly converted into an acid salt and partly into alcohol [KCET 2003]
 (a) Benzyl alcohol (b) Acetaldehyde
 (c) Acetone (d) Benzaldehyde
88. Which of the following does not give brick red precipitate with Fehling solution [AIIMS 1996]

- (a) Acetone (b) Acetaldehyde
(c) Formalin (d) D-glucose
89. Acetaldehyde and acetone can be distinguished by
[AIIMS 1996; DCE 1999; Pb. CET 2000]
(a) Molisch test (b) Bromoform test
(c) Solubility in water (d) Tollen's test
90. Which compound is soluble in H_2O [RPMT 1997]
(a) $HCHO$ (b) CH_3CHO
(c) CH_3COCH_3 (d) All
91. $CH_3CHO + CH_3MgBr \rightarrow$ Product $\xrightarrow{H_2O} A$
What is A? [RPMT 1997]
(a) Primary alcohol (b) Secondary alcohol
(c) Tertiary alcohol (d) Ketone
92. Which gives lactic acid on hydrolysis after reacting with HCN [UPSEAT 2003; MP PMT 2003]
(a) $HCHO$ (b) CH_3CHO
(c) C_6H_5CHO (d) CH_3COCH_3
93. CH_3CHO react with aqueous $NaOH$ solution to form
[MP PMT 1992]
(a) 3-hydroxy butanal (b) 2-hydroxy butanal
(c) 4-hydroxy butanal (d) 3-hydroxy butanol
94. Fehling solution react with $HCHO$ to form precipitate of
[MP PMT 1992]
(a) White colour (b) Yellow colour
(c) Red colour (d) Blue colour
95. Product in following reaction is
 $CH_3MgI + HCHO \rightarrow$ Product
[RPMT 2003; BHU 1998, 2005; DCE 1999]
(a) CH_3CHO (b) CH_3OH
(c) C_2H_5OH (d) CH_3-O-CH_3
96. $A \xrightarrow[800^\circ C]{\Delta} CH_2 = C = O$, Reactant 'A' in the reaction is
[RPMT 2003]
(a) CH_3CH_2CHO (b) CH_3CHO
(c) $CH_3-\overset{\overset{O}{||}}{C}-CH_3$ (d) C_2H_5OH
97. Only an aldehyde having..... can undergo the aldol condensation
[KCET 1998]
(a) At least one beta H atom
(b) At least one alpha H atom
(c) An aromatic ring
(d) No alpha H atom
98. Clemenson's reduction of ketones is carried out in
[BHU 2000]
(a) H_2 with Pd catalyst (b) Glycol with KOH
(c) $LiAlH_4$ in water (d) $Zn-Hg$ with HCl
99. Reaction



called

[MP PET 2003]

- (a) Wolff-Kishner reaction (b) Tischenko reaction
(c) Reformatsky reaction (d) Gattermann reaction
100. Propanal on treatment with dilute sodium hydroxide forms
[Kerala CET 2000]
(a) $CH_3CH_2CH_2CH_2CH_2CHO$
(b) $CH_3CH_2CH(OH)CH_2CH_2CHO$
(c) $CH_3CH_2CH(OH)CH(CH_3)CHO$
(d) CH_3CH_2COONa
101. Identify the product Y in the sequence
 $CH_3CHO + CH_3MgI \xrightarrow{\text{Ether}} X \xrightarrow{H_2O / H^+} Y$
[Kerala (Med.) 2001]
(a) CH_3OH (b) CH_3CH_2OH
(c) $(CH_3)_2CHOH$ (d) $(CH_3)_3COH$
102. What is the name of reaction when benzaldehyde changes into benzyl alcohol [CPMT 1996; RPET 1999]
(a) Friedel-Craft's reaction (b) Kolbe's reaction
(c) Wurtz reaction (d) Cannizzaro reaction
103. The reagent that gives an orange coloured precipitate with acetaldehyde
[EAMCET 1997; Pb. PMT 2004; AIIMS 1987]
(a) NH_2OH (b) $NaHSO_3$
(c) Iodine (d) 2, 4-DNP
104. Which one is used in the manufacture of mirror
[MP PET 1992]
(a) Red lead (litharge)
(b) Ammoniacal $AgNO_3$
(c) Ammoniacal $AgNO_3 +$ Red lead
(d) Ammoniacal $AgNO_3 + HCHO$
105. When CH_3COCH_3 reacts with Cl_2 and $NaOH$, which of the following is formed [CPMT 1996]
(a) $CHCl_3$ (b) CCl_4
(c) CCl_2H_2 (d) CH_3Cl
106. Which gives difference between aldehyde and ketone
[CPMT 1994]
(a) Fehling's solution (b) Tollen's reagent
(c) Schiff's reagent (d) Benedict's solution
(e) All of these
107. Aldehyde turns pink with [Bihar MEE 1997]
(a) Benedict solution (b) Schiff reagent
(c) Fehling solution (d) Tollen's reagent
(e) Molisch reagent

108. Which of the following would undergo aldol condensation

[MP PMT 1986; BHU 1995]

- (a) $CCl_3.CHO$ (b) $CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}} - CHO$
- (c) $CH_3.CH_2.CHO$ (d) $HCHO$

109. The reaction of acetaldehyde with conc. $KMnO_4$ gives

[DPMT 1982; AIIMS 1996]

- (a) CH_3COOH (b) CH_3CH_2OH
- (c) $HCHO$ (d) CH_3OH

110. When acetaldehyde is heated with Tollen's reagent, following is obtained [CPMT 1989; MP PET/PMT 1988]

- (a) Methyl alcohol (b) Silver acetate
- (c) Silver mirror (d) Formaldehyde

111. Boiling point of acetone is [CPMT 1975, 89]

- (a) $56^\circ C$ (b) $60^\circ C$
- (c) $100^\circ C$ (d) $90^\circ C$

112. Urotropine is

- (a) Hexamethylene tetramine
- (b) Hexaethylene tetramine
- (c) Hexamethylene diamine
- (d) None of these

113. Magenta is [DPMT 1982; Kurukshetra CEE 1998]

- (a) Alkaline phenolphthalein
- (b) Methyl red
- (c) *p*-rosaniline hydrochloride
- (d) Red litmus

114. An aldehyde on oxidation gives [CPMT 1973, 03; DPMT 1983; Manipal MEE 1995]

- (a) An alcohol (b) An acid
- (c) A ketone (d) An ether

115. The reaction of an aldehyde with hydroxylamine gives a product which is called [MP PET 1993; AFMC 2002]

- (a) Aminohydroxide (b) Hydrazone
- (c) Semicarbazone (d) Oxime

116. Cannizzaro reaction is not shown by

[BHU 1980; IIT 1983; KCET 1993; Bihar MEE 1995;

RPMT 1997, 2000, 02]

- (a) $HCHO$ (b) C_6H_5CHO
- (c) CH_3CHO (d) All of these

117. When acetone is heated with hydroxylamine, the compound formed is [MP PMT 1993]

- (a) Cyanohydrin (b) Oxime
- (c) Semicarbazone (d) Hydrazone

118. The product of the reaction between ammonia and formaldehyde is [MP PMT 1993]

- (a) Urotropine (b) Formamide
- (c) Paraformaldehyde (d) Methanol

119. Which of the following products is obtained by the oxidation of propionaldehyde [CPMT 1989]

- (a) Acetic acid
- (b) Formic acid and acetic acid
- (c) Propanoic acid
- (d) *n*-propyl alcohol

120. When acetaldehyde reacts with PCl_5 , the resulting compound is [MP PMT 1992, 93]

- (a) Ethyl chloride (b) Ethylene chloride
- (c) Ethylidene chloride (d) Trichloro acetaldehyde

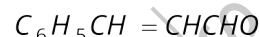
121. Benzaldehyde and acetaldehyde can be differentiated by

- (a) HCN (b) NH_2OH
- (c) Hydrazine (d) $NaOH$ solution

122. In the presence of a dilute base C_6H_5CHO and CH_3CHO react together to give a product. The product is

[MP PET 1994]

- (a) $C_6H_5CH_3$ (b) $C_6H_5CH_2CH_2OH$
- (c) $C_6H_5CH_2OH$ (d)



123. Grignard's reagent reacts with ethanal (acetaldehyde) and propanone to give

- (a) Higher aldehydes with ethanal and higher ketones with propanone
- (b) Primary alcohols with ethanal and secondary alcohols with propanone
- (c) Ethers with ethanal and alcohols with propanone
- (d) Secondary alcohols with ethanal and tertiary alcohols with propanone

124. Base catalysed aldol condensation occurs with

[IIT-JEE 1991]

- (a) Benzaldehyde
- (b) 2, 2-dimethyl propionaldehyde
- (c) Acetaldehyde
- (d) Formaldehyde

125. Benzaldehyde reacts with ammonia to form

[CPMT 1989; AFMC 1998]

- (a) Benzaldehyde ammonia
(b) Urotropine
(c) Hydrobenzamide
(d) Aniline
- 126.** Glucose + Tollen's reagent \rightarrow Silver mirror shows
[CPMT 1997]
(a) Presence of acidic group
(b) Presence of alkaline group
(c) Presence of ketonic group
(d) Presence of aldehyde group
- 127.** Fehling solution is [MP PMT 1989]
(a) Ammoniacal cuprous chloride solution
(b) Acidified copper sulphate solution
(c) Copper sulphate and sodium hydroxide + Rochelle salt
(d) None of these
- 128.** Reduction of an aldehyde produces [MP PMT 1994; MP PET 2001]
(a) Primary alcohol (b) Monocarboxylic acid
(c) Secondary alcohol (d) Tertiary alcohol
- 129.** Which of the following on reaction with conc. NaOH gives an alcohol [MP PET 1996]
(a) Methanal (b) Ethanal
(c) Propanal (d) Butanal
- 130.** Schiff's reagent is [MP PMT 1989]
(a) Magenta colour solution decolourised with sulphurous acid
(b) Ammoniacal cobalt chloride solution
(c) Ammoniacal manganese sulphate solution
(d) Magenta solution decolourised with chlorine
- 131.** Pyrolysis of acetone gives $\text{CH}_2 = \text{C} = \text{O}$ called
(a) Methylene oxide
(b) Methyl carbon monoxide
(c) Ketene
(d) Methone
- 132.** Which one of the following on oxidation will not give a carboxylic acid with the same number of carbon atoms [CBSE PMT 1992; MP PET 1996]
(a) CH_3COCH_3 (b) $\text{CCl}_3\text{CH}_2\text{CHO}$
(c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ (d) $\text{CH}_3\text{CH}_2\text{CHO}$
- 133.** Acetal is obtained by reacting in the presence of dry HCl and alcohol with [MP PET 1996]
(a) Aldehyde (b) Ketone
(c) Ether (d) Carboxylic acid
- 134.** The reagent with which both aldehyde and acetone react easily is [CPMT 1973, 74, 89; BIT 1992]
(a) Fehling's reagent (b) Grignard reagent
(c) Schiff's reagent (d) Tollen's reagent
- 135.** Phenylmethanol can be prepared by reducing the benzaldehyde with [CBSE PMT 1997]
(a) CH_3Br (b) Zn and HCl
(c) CH_3Br and Na (d) CH_3I and Mg
- 136.** Which of the following is used in the manufacture of thermosetting plastics
(a) Formaldehyde (b) Acetaldehyde
(c) Acetone (d) Benzaldehyde
- 137.** Which compound undergoes iodoform reaction [DPMT 1984; CPMT 1989]
(a) HCHO (b) CH_3CHO
(c) CH_3OH (d) CH_3COOH
- 138.** Which does not react with Fehling solution [MNR 1983, 93]
(a) Acetaldehyde (b) Benzaldehyde
(c) Glucose (d) Formic acid
- 139.** Which of the following compound will react with ethanolic KCN [IIT-JEE 1984]
(a) Ethane (b) Acetyl chloride
(c) Chlorobenzene (d) Benzaldehyde
- 140.** Schiff's reagent gives pink colour with [EAMCET 1980; MP PMT 2000]
(a) Aldehydes (b) Ethers
(c) Ketones (d) Carboxylic acid
- 141.** Acetaldehyde reacts with Cl_2 (in excess) to give [MP PMT 1997]
(a) Chloral (b) Chloroform
(c) Acetic acid (d) Trichloroacetic acid
- 142.** The compound which reacts with Fehling solution is [CPMT 1989]
(a) $\text{C}_6\text{H}_5\text{COOH}$ (b) HCOOH
(c) $\text{C}_6\text{H}_5\text{CHO}$ (d) CH_2ClCH_3
- 143.** Which one of the following undergoes reaction with 50% sodium hydroxide solution to give the corresponding alcohol and acid [AIEEE 2004]
(a) Butanal (b) Benzaldehyde
(c) Phenol (d) Benzoic acid
- 144.** Which one of the following is reduced with zinc and hydrochloric acid to give the corresponding hydrocarbon

[AIEEE 2004]

- (a) Acetamide (b) Acetic acid
(c) Ethyl acetate (d) Butan-2-one

145. Three molecules of acetone in the presence of dry HCl form

[MP PET 2004]

- (a) Mesitylene (b) Phorone
(c) Glyoxal (d) Mesityl oxide

146. Aldehydes and ketones can be reduced to corresponding hydrocarbons by

[Kerala PMT 2004]

- (a) Refluxing with water
(b) Refluxing with strong acids
(c) Refluxing with soda amalgam and water
(d) Refluxing with zinc amalgam and concentrated HCl
(e) Passing the vapour under heated PbO_2

147. Acetone reacts with iodine to form iodoform in the presence of

[BHU 2004; CPMT 2004]

- (a) $CaCO_3$ (b) $NaOH$
(c) KOH (d) $MgCO_3$

148. Cyanohydrin of which of the following forms lactic acid

[MHCET 2003]

- (a) CH_3CH_2CHO (b) CH_3CHO
(c) $HCHO$ (d) CH_3COCH_3

149. Which of the following is used to detect aldehydes

[MHCET 2004]

- (a) Million's test
(b) Tollen's reagent
(c) Neutral ferric chloride solution
(d) Molisch's test

150. Which of the following aldehydes give red precipitate with Fehling solution?

[MHCET 2004]

- (a) Benzaldehyde (b) Salicylaldehyde
(c) Acetaldehyde (d) None of these

151. $A \longrightarrow (CH_3)_2C = CHCOCH_3$ A is

[MHCET 2004]

- (a) Acetone (b) Acetaldehyde
(c) Propionaldehyde (d) Formaldehyde

152. The aldehyde which react with $NaOH$ to produce an alcohol and sodium salt is

[Pb. PMT 2004]

- (a) $HCHO$ (b) CH_3CHO
(c) CH_3CH_2CHO (d) $CH_3CH_2CH_2CHO$

153. Acetaldehyde and Acetone can be distinguished by

[DCE 2003]

- (a) Iododorm test

- (b) Nitroprusside test
(c) Fehling's solution test
(d) DNP test

154. $OCH - CHO \xrightarrow{OH^-} HOH_2C - COOH$

The reaction given is

[DCE 2003]

- (a) Aldol condensation (b) Knoevenagel reaction
(c) Cannizzaro reaction (d) None of these

155. The order of susceptibility of nucleophilic attack on aldehydes follows the order

[DCE 2002]

- (a) $1^\circ > 3^\circ > 2^\circ$ (b) $1^\circ > 2^\circ > 3^\circ$
(c) $3^\circ > 2^\circ > 1^\circ$ (d) $2^\circ > 3^\circ > 1^\circ$

156. In Wolf-Kishner reduction, the carbonyl group of aldehydes and ketones is converted into

[Pb. CET 2000]

- (a) $>CH_2$ group (b) $-CH_3$ group
(c) $-CH_2OH$ group (d) $>CHOH$ group

157. Which of the following react with $NaHSO_3$

[Pb. CET 2003]

- (a) CH_3COCH_3 (b) CH_3CHO
(c) $HCHO$ (d) All of these

158. Fehling solution is

[Pb. CET 2003]

- (a) $CuSO_4$ + lime (b) $CuSO_4 + NaOH(aq)$
(c) $CuSO_4 + Na_2CO_3$ (d) None of these

159. Wolf kishner reduction, reduces

[Pb. CET 2003]

- (a) $-COOH$ group (b) $-C \equiv C$ - group
(c) $-CHO$ group (d) $-O$ - group

160. A compound has a vapour density of 29. On warming an aqueous solution of alkali, it gives a yellow precipitate. The compound is

[DPMT 2004]

- (a) CH_3CH_2CHO (b) $CH_3CHOHCH_3$
(c) CH_3COCH_3 (d) CH_3CH_2COOH

161. Which responds to +ve iodoform test?

[Orissa JEE 2004]

- (a) Butanol (b) Butan-1-al
(c) Butanol-2 (d) 3-pentanone

162. The correct order of reactivity of $PhMgBr$ with

[IIT-JEE (Screening) 2004]



- (I) (II) (III)
- (a) (I) > (II) > (III) (b) (III) > (II) > (I)
- (c) (II) > (III) > (I) (d) (I) > (III) > (II)
163. The pair of compounds in which both the compounds give positive test with Tollen's reagent is [IIT-JEE (Screening) 2004]
- (a) Glucose and Sucrose
- (b) Fructose and Sucrose
- (c) Acetophenone and Hexanal
- (d) Glucose and Fructose
164. The most appropriate reagent to distinguish between acetaldehyde and formaldehyde is [UPSEAT 2004]
- (a) Fehling's solution
- (b) Tollen's reagent
- (c) Schiff's reagent
- (d) Iodine in presence of base
165. Silver mirror test can be used to distinguish between [MP PET 2004]
- (a) Ketone and acid (b) Phenol and acid
- (c) Aldehyde and acid (d) Alcohol and phenol
166. Paraldehyde is [CPMT 1985; MP PET 1992, 96; RPMT 2000]
- (a) A trimer of formaldehyde
- (b) A trimer of acetaldehyde
- (c) A hexamer of formaldehyde
- (d) A hexamer of acetaldehyde
167. Paraldehyde is used as a [CBSE PMT 1989]
- (a) Medicine (b) Poison
- (c) Polymer (d) Dye
168. Formalin is an aqueous solution of [BHU 1979; DPMT 1983]
- (a) Formic acid (b) Formaldehyde
- (c) Fluorescein (d) Furfuraldehyde
169. Hexamethylene tetramine is used as [MP PMT 1979, 84]
- (a) Analgesic (b) Antipyretic
- (c) Urinary antiseptic (d) All of these
170. Methyl ketone group is identified by [BCECE 2005]
- (a) Iodoform test (b) Fehling solution
- (c) Tollen's reagent (d) Schiff's reagent
171. Which of the following does not give Fehling solution test? [BCECE 2005]
- (a) Acetone (b) Propanal
- (c) Ethanal (d) Butanal
172. How will you convert butan-2-one to propanoic acid? [IIT 2005]

- (a) Tollen's reagent (b) Fehling's solution
- (c) $\text{NaOH/I}_2/\text{H}^+$ (d) NaOH/NaI/H^+
173. Ketones react with Mg-Hg over water gives [AFMC 2005]
- (a) Pinacolone (b) Pinacols
- (c) Alcohols (d) None of these
174. Which of the following will form two isomers with semi carbazide [Orissa JEE 2005]
- (a) Benzaldehyde (b) Acetone
- (c) Benzoquinone (d) Benzophenone
175. A compound $A \rightarrow \text{C}_5\text{H}_{10}\text{Cl}_2$ on hydrolysis gives $\text{C}_5\text{H}_{10}\text{O}$ which reacts with NH_2OH , forms iodoform but does not give fehling test. A is [DPMT 2005]
- (a) $\text{CH}_3 - \overset{\text{Cl}}{\underset{\text{Cl}}{\text{C}}} - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$
- (b) $\text{CH}_3\text{CH}_2 - \overset{\text{Cl}}{\underset{\text{Cl}}{\text{C}}} - \text{CH}_2\text{CH}_3$
- (c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\overset{\text{Cl}}{\underset{\text{Cl}}{\text{CH}}}$
- (d) $\text{CH}_3 - \overset{\text{Cl}}{\text{CH}} - \overset{\text{Cl}}{\text{CH}} - \text{CH}_2 - \text{CH}_3$
176. $\text{CH}_3 - \text{CHO} + \text{HCN} \rightarrow A$; Compound A on hydrolysis gives [Kerala CET 2005]
- (a) $\text{CH}_3 - \text{CH}_2 - \text{COOH}$
- (b) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{NH}_2$
- (c) $\text{CH}_3 - \text{CO} - \text{COOH}$
- (d) $\text{CH}_3\text{CO} - \text{CH} = \text{NOH}$
- (e) $\text{CH}_3 - \overset{\text{OH}}{\underset{\text{OH}}{\text{CH}}} - \text{COOH}$
177. Which one does not give cannizzaro's reaction [Kerala CET 2005]
- (a) Benzaldehyde
- (b) 2-methyl propanal
- (c) *p*-methoxy benzaldehyde
- (d) 2,2 dimethyl propanal
- (e) Formaldehyde

1. Which of the following will fail to react with potassium dichromate and dilute sulphuric acid
- Ethyl alcohol (ethanol)
 - Acetaldehyde (ethanal)
 - Secondary propyl alcohol (2-propanol)
 - Acetone (propanone)
2. Acetone and acetaldehyde are differentiated by

[CPMT 1987, 93]

- $\text{NaOH} + \text{I}_2$
 - $\text{Ag}(\text{NH}_3)_2^+$
 - HNO_2
 - I_2
3. Which of the following will react with water [IIT 1998]
- CHCl_3
 - Cl_3CCHO
 - CCl_4
 - $\text{ClCH}_2\text{CH}_2\text{Cl}$

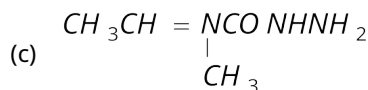
4. An organic compound 'A' has the molecular formula $\text{C}_3\text{H}_6\text{O}$, it undergoes iodoform test. When saturated with dil. HCl it gives 'B' of molecular formula $\text{C}_9\text{H}_{14}\text{O}$. A and B respectively are [Tamil Nadu CET 2002]

- Propanal and mesitylene
 - Propanone and mesityl oxide
 - Propanone and 2,6-dimethyl-2,5-heptadien-4-one
 - Propanone and mesitylene oxide
5. Which alkene is formed from the following reaction $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}=\text{PPh}_3 + 2$ - Butanone

[Manipal 2001]

- 3-Methyl-3-heptene
 - 4-Methyl-3-heptene
 - 5-Methyl-3-heptene
 - 1-Methyl-5-methane
6. Compound 'A' (molecular formula $\text{C}_3\text{H}_8\text{O}$) is treated with acidified potassium dichromate to form a product 'B' (molecular formula $\text{C}_3\text{H}_6\text{O}$). 'B' forms a shining silver mirror on warming with ammoniacal silver nitrate. 'B' when treated with an aqueous solution of $\text{H}_2\text{NCONHNH}_2 \cdot \text{HCl}$ and sodium acetate gives a product 'C'. Identify the structure of 'C' [IIT-JEE (Screening) 2002]

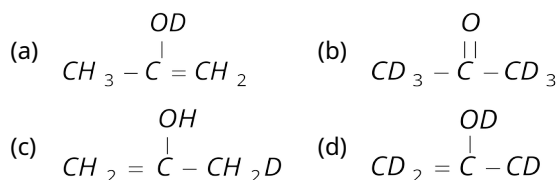
- $\text{CH}_3\text{CH}_2\text{CH}=\text{NNHCONH}_2$
- $\text{CH}_3-\text{CH}=\underset{\text{CH}_3}{\text{NNHCONH}_2}$



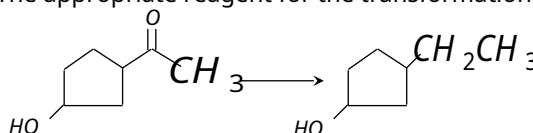
7. Which is not true about acetophenone [Manipal 2002]
- Reacts to form 2,4-dinitrophenyl hydrazine
 - Reacts with Tollen's reagent to form silver mirror
 - Reacts with I_2 / NaOH to form iodoform
 - On oxidation with alkaline KMnO_4 followed by hydrolysis gives benzoic acid

8. The enol form of acetone, after treatment with D_2O , gives

[IIT-JEE (Screening) 1999]

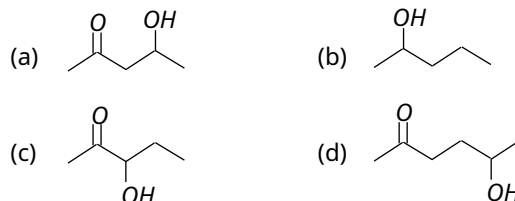


9. The appropriate reagent for the transformation



[IIT-JEE (Screening) 2000]

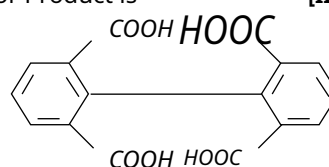
- $\text{Zn(Hg)}, \text{HCl}$
 - $\text{NH}_2\text{NH}_2\text{OH}^-$
 - H_2 / Ni
 - NaBH_4
10. Which of the following has the most acidic hydrogen [IIT-JEE (Screening) 2000]
- 3-hexanone
 - 2,4-hexanedione
 - 2,5-hexanedione
 - 2,3-hexanedione
11. Which of the following will be most readily dehydrated in acidic conditions [IIT-JEE (Screening) 2000]



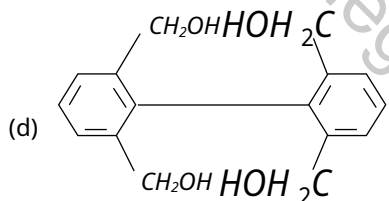
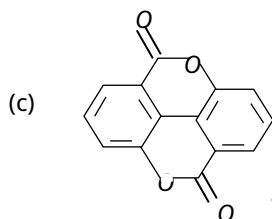
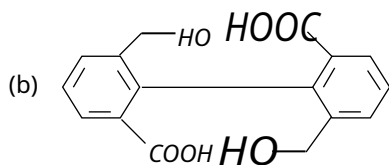
12. (i) $\text{NaOH} / 100^\circ\text{C}$
(ii) $\text{H}^+ / \text{H}_2\text{O}$

Major Product is

[IIT-JEE (Screening) 2003]



(a)



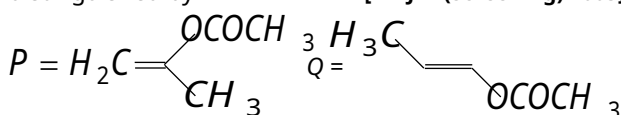
13. Among the given compounds, the most susceptible to nucleophilic attack at the carbonyl group is [IIT 1997]

- (a) MeCOCl (b) MeCHO
(c) MeCOOMe (d) MeCOOCOMe

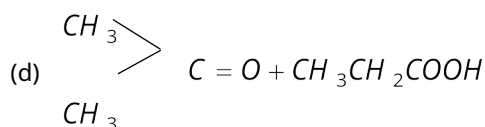
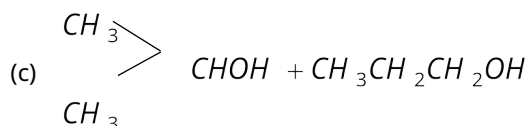
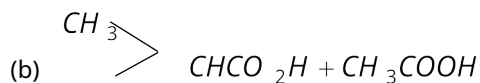
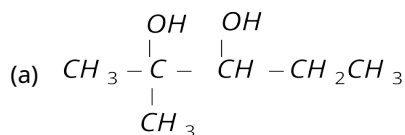
14. Which of the following will give yellow precipitate with I_2 / NaOH [IIT 1997]

- (a) $\text{ICH}_2\text{COCH}_2\text{CH}_3$
(b) $\text{CH}_3\text{COOCOCH}_3$
(c) CH_3CONH_2
(d) $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}_3$

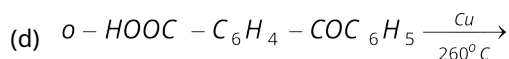
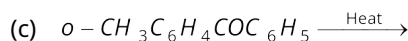
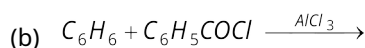
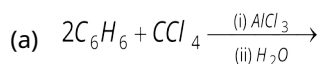
15. The product of acid hydrolysis of P and Q can be distinguished by [IIT-JEE (Screening) 2003]



- (a) Lucas Reagent (b) 2,4-DNP
(c) Fehling's Solution (d) NaHSO_3
16. On vigorous oxidation by permanganate solution $(\text{CH}_3)_2\text{C}=\text{CH}-\text{CH}_2\text{CH}_2\text{CH}_3$ gives [AIEEE 2002]



17. Which of the following reactions give benzo phenone [Roorkee Qualifying 1998]



18. Aldehyde and ketones can decolourize by [CPMT 2003]

- (a) Bromine water (b) Quick lime
(c) $\text{dil. H}_2\text{SO}_4$ (d) None of these

19. Which of the following statements regarding chemical properties of acetophenone are wrong



- (1) It is reduced to methyl phenyl carbinol by sodium and ethanol
(2) It is oxidised to benzoic acid with acidified KMnO_4
(3) It does not undergo iodoform electrophilic substitution like nitration at meta position
(4) It does not undergo iodoform reaction with iodine and alkali

[Tamil Nadu CET 2001]

- (a) 1 and 2 (b) 2 and 4
(c) 3 and 4 (d) 1 and 3

20. The product(s) obtained via oxymercuration ($\text{HgSO}_4 + \text{H}_2\text{SO}_4$) of 1-butyne would be [IIT-JEE 1999]

- (a) $\text{CH}_3\text{CH}_2\text{COCH}_3$
(b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$
(c) $\text{CH}_3\text{CH}_2\text{CHO} + \text{HCHO}$
(d) $\text{CH}_3\text{CH}_2\text{COOH} + \text{HCOOH}$

- 


- (a) An aldehyde (b) An acid
(c) An alcohol (d) an ether

Assertion & Reason

For AIIMS Aspirants

- If both assertion and reason are true and the reason is the correct explanation of the assertion.
- If both assertion and reason are true but reason is not the correct explanation of the assertion.
- If assertion is true but reason is false.
- If the assertion and reason both are false.
- If assertion is false but reason is true.

3. Assertion : Lower aldehyde and ketones are soluble in water but the solubility decreases as molecular mass increases.

- Reason : Aldehydes and ketones can be distinguished by Tollen's reagent. [AIIMS 1994]
4. Assertion : Acetaldehyde on treatment with alkaline gives aldol.
- Reason : Acetaldehyde molecules contains α hydrogen atom. [AIIMS 1997]
5. Assertion : Acetylene on treatment with alkaline $KMnO_4$ produce acetaldehyde.
- Reason : Alkaline $KMnO_4$ is a reducing agent. [AIIMS 2000]
6. Assertion : Acetophenone and benzophenone can be distinguished by iodoform test.
- Reason : Acetophenone and benzophenone both are carbonyl compounds. [AIIMS 2002]
7. Assertion : Isobutanal does not give iodoform test
- Reason : It does not have α -hydrogen. [AIIMS 2004]
8. Assertion : Benzaldehyde is more reactive than ethanol towards nucleophilic attack.
- Reason : The overall effect of $-I$ and $+R$ effect of phenyl group decreases the electron density on the carbon atom of $>C=O$ group in benzaldehyde.
9. Assertion : Aldol condensation can be catalysed both by acids and bases.
- Reason : β -Hydroxy aldehydes or ketones readily undergo acid catalysed dehydration.
10. Assertion : Ketones are less reactive than aldehydes.
- Reason : Ketones do not give schiff's test.
11. Assertion : Oximes are less acidic than hydroxyl amine.
- Reason : Oximes of aldehydes and ketones show geometrical isomerism.
12. Assertion : The bond energy of $>C=O$ is less than $>C=C<$ in alkenes.
- Reason : The carbon atom in carbonyl group is sp^2 hybridised.
13. Assertion : $R-C\equiv O^+$ is more stable than $R-C^+=O$.
- Reason : Resonance in carbonyl compound provides C^+ and O^- .
14. Assertion : Formaldehyde cannot be prepared by Rosenmund's reduction.
- Reason : Acid chlorides can be reduced into aldehydes with hydrogen in boiling xylene using palladium or platinum as a catalyst supported on barium sulphate. This is known as Rosenmund's reduction.

15. Assertion : CH_3CHO reacts with NH_3 to form urotropine.

Reason : Urotropine is used as medicine in case of urinary troubles.

16. Assertion : α -Hydrogen atoms in aldehydes and ketones are acidic.

Reason : The anion left after the removal of α -hydrogen is stabilized by inductive effect.

17. Assertion : 2, 2-Dimethyl propanal undergoes Cannizzaro reaction with concentrated $NaOH$.

Reason : Cannizzaro is a disproportionation reaction.

18. Assertion : Benzaldehyde undergoes aldol condensation.

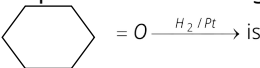
Reason : Aldehydes that do not have α -hydrogen undergo aldol condensation.

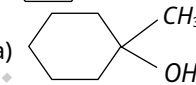
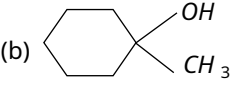

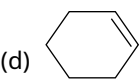
Answers

Introduction

1	a	2	b	3	a	4	c	5	a
6	c	7	b	8	b	9	a	10	b
11	b	12	d	13	d	14	b	15	a
16	c	17	c	18	c				

- Benzophenone can be converted into benzene using
[Tamil Nadu CET 2001]
 - Fused alkali
 - Anhydrous $AlCl_3$
 - Sodium amalgam in water
 - Acidified dichromate
- The reagent(s) which can be used to distinguish acetophenone from benzophenone is (are)
[CBSE PMT 1990]
 - 2, 4-dinitrophenyl hydrazine
 - Aqueous solution of $NaHSO_3$
 - Benedict reagent
 - I_2 and Na_2CO_3
- When acetaldehyde is heated with Fehling solution, it gives a red precipitate of
[MP PET 1989, 93; IIT 1982; MP PET/PMT 1998; RPMT 2002]
 - Cu
 - CuO
 - Cu_2O
 - $Cu(OH)_2$
- The general order of reactivity of carbonyl compounds for nucleophilic addition reactions is [CBSE PMT 1995]
 - $H_2C=O > RCHO > ArCHO > R_2C=O > Ar_2C=O$
 - $ArCHO > Ar_2C=O > RCHO > R_2C=O > H_2C=O$
 - $Ar_2C=O > R_2C=O > ArCHO > RCHO > H_2C=O$
 - $H_2C=O > R_2C=O > Ar_2C=O > RCHO > ArCHO$
- Which of the following gives an alcohol and salt of carboxylic acid when reacted with conc. $NaOH$
[MP PMT 1999]
 - CH_3CHO
 - C_6H_5CHO
 - CH_3COCH_3
 - $C_6H_5COCH_3$
- Which of the following compounds would undergo Cannizzaro's reaction
[CPMT 1989; AFMC 1991; MNR 1995]
 - Propionaldehyde
 - Benzaldehyde
 - Bromobenzene
 - Acetaldehyde
- $NaOH / H^+$ reacts with
[BHU 2003]
 - $C_6H_5OCH_3$
 - CH_3OH
 - $CH_3-C(=O)-CH_3$
 - C_2H_5OH
- The product of following reaction
[Kerala CET 2000]



 - 
 - 
 - 
 - 
- Which of the following aldehydes is most reactive towards nucleophilic addition reactions
[Roorkee 1992; RPMT 1997]
 - $HCHO$
 - CH_3CHO
 - C_2H_5CHO
 - CH_3COCH_3
- Which one of the following gives iodoform test
[AIIMS 1996]
 - Formaldehyde
 - Ethyl alcohol
 - Benzyl alcohol
 - Benzaldehyde
- The active ion in Tollen's reagent is
 - Cu^+
 - $Cu(NH_3)_2^+$
 - Ag^+
 - $Ag(NH_3)_2^+$

12. Among the following compounds, which will react with acetone to give a product containing $>C=N-$

[IIT 1998]

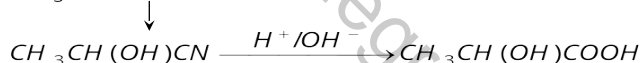
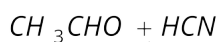
- (a) $C_6H_5NH_2$
 (b) $(CH_3)_3N$
 (c) $C_6H_5NHC_6H_5$
 (d) $C_6H_5NHNH_2$

13. Which of the following does not give yellow precipitate with I_2 and $NaOH$

[MP PET 1996]

- (a) C_2H_5OH (b) CH_3CHO
 (c) CH_3COCH_3 (d) $HCHO$

14. In this reaction



an asymmetric centre is generated. The acid obtained would be

[CBSE PMT 2003]

- (a) 20% *D* + 80% *L*-isomer
 (b) *D*-isomer
 (c) *L*-isomer
 (d) 50% *D* + 50% *L*-isomer

15. Aldehydes are produced in atmosphere by

[NCERT 1982]

- (a) Oxidation of secondary alcohols
 (b) Reduction of alkenes
 (c) Reaction of oxygen atoms with hydrocarbons
 (d) Reaction of oxygen atoms with ozone

16. Which of the following compounds will give positive test with Tollen's reagent

[CBSE PMT 1994; Kurukshetra CEE 1998; AFMC 2002]

- (a) Acetamide
 (b) Acetaldehyde
 (c) Acetic acid
 (d) Acetone

17. $ArH + R-\overset{\overset{O}{||}}{C}-Cl \xrightarrow{\text{Lewis acid}} Ar-\overset{\overset{O}{||}}{C}-R + HCl$ is an example of

- (a) Friedel-Craft's alkylation
 (b) Friedel-Craft's acylation
 (c) Cannizzaro reaction
 (d) Claisen condensation

18. Which of the following fails to answer the iodoform test.

[CBSE PMT 1989]

- (a) Pentanone-1
 (b) Pentanone-2
 (c) Propanone-2
 (d) Ethanol

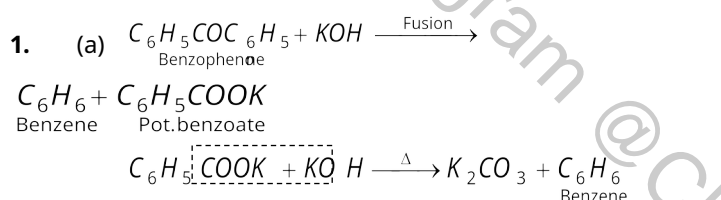
19. The reagent used for the separation of acetaldehyde from acetophenone is

[AIIMS 2004]

- (a) $NaHSO_4$
 (b) $C_6H_5NHNH_2$
 (c) NH_2OH
 (d) $NaOH - I_2$

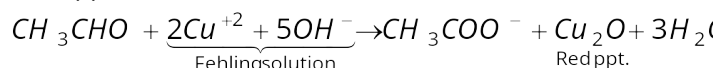
Answers and Solutions

(SET -27)



2. (d) Acetophenone gives iodoform reaction while benzophenone does give this.

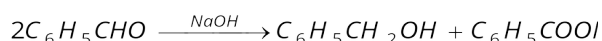
3. (c)



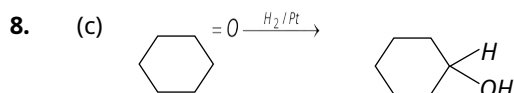
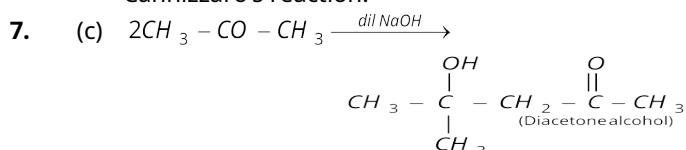
4. (a) The size of the alkyl group. Causes hindrance to attacking group. As the number and size of the alkyl groups increase the hindrance to the attack of nucleophile also increases. Thus the reactivity follows the order



5. (b) Benzaldehyde does not have the α -hydrogen so it will undergo Cannizzaro's reaction.

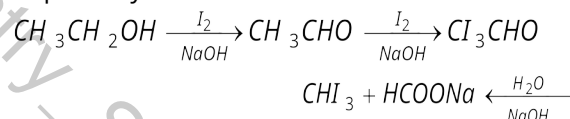


6. (b) $\text{C}_6\text{H}_5\text{CHO}$ Aldehydes - Those aldehyde in which α -H atom is absent can participate in Cannizzaro's reaction.



9. (a) Because alkyl group is absent and they have +ve inductive effect and increases the electron density on the carbonyl group.

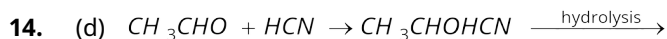
10. (b) The compound having α -hydrogen will give iodoform test. Ethyl alcohol and secondary alcohols also give positive iodoform test because by the action of halogens in alkaline medium, they are oxidised to acetaldehyde and methyl ketones respectively.



11. (d) During reaction Ag^+ gets reduced to Ag metal and forms silver mirror.

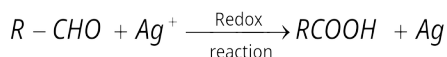
12. (ad) $\text{C}_6\text{H}_5\text{NH}_2$ and $\text{C}_6\text{H}_5\text{NH.NH}_2$ will give the compounds containing $>\text{C}=\text{N}$ -group.

13. (d) $\text{HCHO} \xrightarrow{\text{I}_2/\text{NaOH}}$ No reaction



15. (c) Aldehydes are compounds containing C, H and O. So hydrocarbons react with atmospheric oxygen to give aldehydes.

16. (b) Tollen's reagent is ammoniacal silver nitrate solution. Its reacting species is Ag^+ . It oxidises aliphatic as well as aromatic aldehydes.

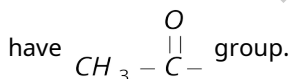


17. (b)

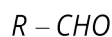
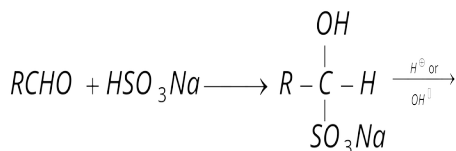


This reaction is Friedel-Craft's acylation.

18. (a) 1-pentanone is an impossible compound does not



19. (a) $NaHSO_3$ gives the addition reaction with Aldehyde and only aliphatic ketone. Acetophenone is the aromatic ketone so it does not give the addition product with $NaHSO_3$ aldehyde from the addition product with $NaHSO_3$ which on treatment with acid or base give again aldehyde.

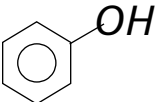


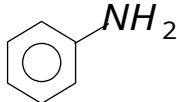
Ordinary Thinking

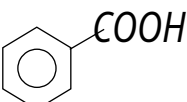
Objective Questions

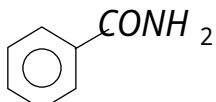
General Introduction of Carboxylic Acids and Their Derivatives

- Identify the wrong statement from the following
[Tamil Nadu CET 2002]
(a) Salicylic acid's a monobasic acid
(b) Methyl salicylate is an ester
(c) Salicylic acid gives violet colour with neutral ferric chloride as well as brisk effervescence with sodium bicarbonate
(d) Methyl salicylate does not occur in natural oils
- Which of the following is optically active
[BHU 1997]
(a) Ethylene glycol (b) Oxalic acid
(c) Glycerol (d) Tartaric acid
- Palmitic acid is
[BHU 1997]
(a) $C_{16}H_{31}COOH$ (b) $C_{17}H_{35}COOH$
(c) $C_{15}H_{31}COOH$ (d) $C_{17}H_{31}COOH$
- Which one among the following represents an amide
[MP PMT 1993]


(a)


(b)


(c)


(d)
- The name of the compound having the structure $ClCH_2CH_2COOH$ is
[MP PET 1993]
(a) 3-chloropropanoic acid (b) 2-chloropropanoic acid
(c) 2-chloroethanoic acid (d) Chlorosuccinic acid
- Fats and oils are mixture of
[CPMT 1993]
(a) Glycerides and saturated fatty acids
(b) Glycerides and unsaturated fatty acids
(c) Glycerides of saturated and unsaturated fatty acids
(d) Only saturated and unsaturated fatty acids
- Which one is not a glyceride
[CPMT 1994]
(a) Fat (b) Oil
(c) Phospholipid (d) Soaps
- $(RCO)_2NH$ is
(a) Primary amine (b) Secondary amine
(c) Secondary amide (d) Tertiary amide
- Which of the following is the formula of tartaremetic

[Manipal MEE 1995]

- $$\begin{array}{c} CH(OH)COOH \\ | \\ CH(OH)COOK \end{array}$$

$$\begin{array}{c} CH(OH)COONa \\ | \\ CH(OH)COO(SbO) \end{array}$$
- Which compound is known as oil of winter green
[MP PET/PMT 1998; CPMT 2002]
(a) Phenyl benzoate (b) Phenyl salicylate
(c) Phenyl acetate (d) Methyl salicylate
- Which of the following structure of carboxylic acid accounts for the acidic nature
[JIPMER 1997]

$$R - \begin{array}{c} \diagup O \\ \diagdown OH \end{array}$$

$$R - \begin{array}{c} \diagup OH \\ \diagdown OH \end{array}$$

$$R - \begin{array}{c} \diagup O \\ \diagdown H \end{array}$$

(d) None of these
- Acetoacetic ester behaves as
[CPMT 1988]
(a) An unsaturated hydroxy compound
(b) A keto compound
(c) Both of these ways
(d) None of these
- The general formula $(RCO)_2O$ represents
[CPMT 1974; DPMT 1982; MP PMT 1996]
(a) An ester (b) A ketone
(c) An ether (d) An acid anhydride
- A tribasic acid is
(a) Oxalic acid (b) Tartaric acid
(c) Lactic acid (d) Citric acid
- Amphiphilic molecules are normally associated with
[Orissa JEE 1997]
(a) Isoprene based polymers
(b) Soaps and detergents
(c) Nitrogen based fertilizers e.g. urea
(d) Pain relieving medicines such as aspirin
- Wax are long chain compounds belonging to the class
[CPMT 1982, 93]
(a) Acids (b) Alcohols
(c) Esters (d) Ethers
- Glycine may be classed as all of the following except
[JIPMER 1997]
(a) A base (b) An acid
(c) A zwitter ion (d) Optically active acid
- Which of the following is not a fatty acid
[CPMT 1988]
(a) Stearic acid (b) Palmitic acid
(c) Oleic acid (d) Phenyl acetic acid
- Vinegar obtained from canesugar contains
[CPMT 1980; DPMT 1982; KCET 1992;

MP PMT 1994; AIIMS 1999]

- (a) Citric acid (b) Lactic acid
(c) Acetic acid (d) Palmitic acid
20. The general formula for monocarboxylic acids is [CPMT 2003]
(a) C_nH_nCOOH (b) $C_nH_{2n+1}COOH$
(c) $C_nH_{2n-1}COOH$ (d) $C_nH_{2n}O_2$
21. Number of oxygen atoms in a acetamide molecule is
(a) 1 (b) 2
(c) 3 (d) 4
22. Urea is [CPMT 1984]
(a) Monoacidic base (b) Diacidic base
(c) Neutral (d) Amphoteric
23. Fats and oils are [CPMT 1990]
(a) Acids (b) Alcohols
(c) Esters (d) Hydrocarbons
24. The general formulas $C_nH_{2n}O_2$ could be for open chain [AIEEE 2003]
(a) Diketones (b) Carboxylic acids
(c) Diols (d) Dialdehydes
25. $\begin{array}{c} O \\ || \\ H-C-Cl \end{array}$ is called
(a) Acetyl chloride (b) Formyl chloride
(c) Chloretone (d) Oxochloromethane
26. Urea
(a) Is an amide of carbonic acid
(b) It is diamide of carbonic acid
(c) Gives carbonic acid on hydrolysis
(d) Resembles carbonic acid
27. Which of the following acids is isomeric with phthalic acid
(a) Succinic acid
(b) Salicylic acid
(c) 1, 4-benzene dicarboxylic acid
(d) Methyl benzoic
28. The ester among the following is [Kerala PMT 2003]
(a) Calcium lactate (b) Ammonium acetate
(c) Sodium acetate (d) None of these
29. Sodium or potassium salts of higher fatty acids are called [MP PET 2003]
(a) Soaps (b) Terpenes
(c) Sugars (d) Alkaloids
30. Formamide is
(a) $HCONH_2$ (b) CH_3CONH_2
(c) $HCOONH_4$ (d) $(HCHO + NH_3)$
31. Oleic, stearic and palmitic acids are [CPMT 1997]
(a) Nucleic acids (b) Amino acids

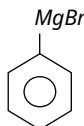
(c) Fatty acids (d) None of these

32. Which one is called ethanoic acid [CPMT 1997]
(a) $HCOOH$ (b) CH_3COOH
(c) CH_3CH_2COOH (d) $CH_3CH_2CH_2COOH$
33. Vinegar is [CPMT 1997]
(a) $HCHO$ (b) $HCOOH$
(c) CH_3CHO (d) CH_3COOH
34. Which of these do not contain $-COOH$ group [CPMT 1997]
(a) Aspirin (b) Benzoic acid
(c) Picric acid (d) Salicylic acid
35. Vinegar obtained from sugarcane has [AFMC 2005]
(a) CH_3COOH (b) $HCOOH$
(c) C_6H_5COOH (d) CH_3CH_2COOH
36. Carbolic acid is [AFMC 2005]
(a) C_6H_5CHO (b) C_6H_6
(c) C_6H_5COOH (d) C_6H_5OH
37. The most acidic of the following is [J & K 2005]
(a) $ClCH_2COOH$ (b) C_6H_5COOH
(c) CD_3COOH (d) CH_3CH_2COOH
38. Which is most reactive of the following [J & K 2005]
(a) Ethyl acetate (b) Acetic anhydride
(c) Acetamide (d) Acetyl chloride

Preparation of Carboxylic Acids and Their Derivatives

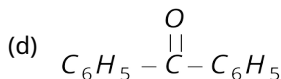
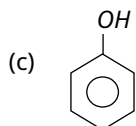
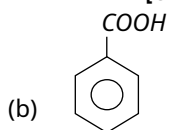
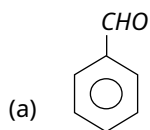
1. Hydrolysis of $CH_3CH_2NO_2$ with 85% H_2SO_4 gives [KCET 1996]
(a) CH_3CH_2OH (b) C_2H_6
(c) $CH_3CH=NOH$ (d) CH_3COOH
2. When formic acid reacts with PCl_5 it forms [MNR 1982]
(a) Formyl chloride (b) Acetyl chloride
(c) Methyl chloride (d) Propionyl chloride
3. Laboratory method for the preparation of acetyl chloride is [RPMT 2003]
(a) $CH_3COOH + SOCl_2 \rightarrow CH_3COCl$
(b) $CH_3COOH + PCl_3 \rightarrow CH_3COCl$
(c) $CH_3COONa + PCl_3 \rightarrow CH_3COCl$
(d) All of these
4. Tischenko reaction yields ester in the presence of catalyst which is
(a) $LiAlH_4$ (b) N-bromosuccinamide

- (c) $Al(OC_2H_5)_3$ (d) $Zn - Hg / HCl$
5. Acetic acid is obtained when [NCERT 1975; CPMT 1977]
 (a) Methyl alcohol is oxidised with potassium permanganate
 (b) Calcium acetate is distilled in the presence of calcium formate
 (c) Acetaldehyde is oxidised with potassium dichromate and sulphuric acid
 (d) Glycerol is heated with sulphuric acid
6. Acetic acid is manufactured by the fermentation of [CPMT 1985]
 (a) Ethanol (b) Methanol
 (c) Ethanal (d) Methanal
7. $CO + NaOH \rightarrow$ [CPMT 1997; KCET 1999]
 (a) $HCOONa$ (b) $C_2H_2O_4$
 (c) $HCOOH$ (d) CH_3COOH
8. Carboxylic acids react with diazomethane to form [MP PMT/PET 1988; MP PMT 1990]
 (a) Amine (b) Alcohol
 (c) Ester (d) Amide
9. $C_2H_2 \xrightarrow[H_2SO_4]{HgOH\ 1\%} A \xrightarrow{[O]} B$, B is [CBSE PMT 1991; BHU 1995]
 (a) An acid (b) An aldehyde
 (c) A ketone (d) Ethanol
10. Reimer-Tiemann reaction involves a [MP PET 1997]
 (a) Carbonium ion intermediate
 (b) Carbene intermediate
 (c) Carbanion intermediate
 (d) Free radical intermediate
11. The product D of the reaction
 $CH_3Cl \xrightarrow{KCN} (A) \xrightarrow{H_2O} (B) \xrightarrow{NH_3} (C) \xrightarrow{\Delta} (D)$ is [MP PET 1997]
 (a) $CH_3CH_2NH_2$ (b) CH_3CN
 (c) $HCONH_2$ (d) CH_3CONH_2
12. Which of the following on hydrolysis forms acetic acid [BHU 1997]
 (a) CH_3CN (b) CH_3OH
 (c) C_2H_5OH (d) $C_2H_5NH_2$
13. When benzyl alcohol is oxidised with $KMnO_4$, the product obtained is [SCRA 1991]
 (a) Benzaldehyde (b) Benzoic acid
 (c) CO_2 and H_2O (d) None of these
14. Which of the following gives benzoic acid on oxidation [CBSE PMT 1996]
 (a) Chlorophenol (b) Chlorotoluene
 (c) Chlorobenzene (d) Benzyl chloride
15. $(CH_3)_2CO \xrightarrow[(HCl)]{NaCN} A \xrightarrow[\Delta]{H_3O^+} B$ In the above sequence of reactions A and B are [CPMT 2000]
 (a) $(CH_3)_2C(OH)CN, (CH_3)_2C(OH)COOH$
 (b) $(CH_3)_2C(OH)CN, (CH_3)_2C(OH)_2$
 (c) $(CH_3)_2C(OH)CN, (CH_3)_2CHCOOH$
 (d) $(CH_3)_2C(OH)CN, (CH_3)_2C=O$
16. Two moles of acetic acid are heated with P_2O_5 . The product formed is [MP PET/PMT 1988]
 (a) 2 moles of ethyl alcohol
 (b) Formic anhydride
 (c) Acetic anhydride
 (d) 2 moles of methyl cyanide
17. Formic acid is obtained when [NCERT 1974]
 (a) Calcium acetate is heated with conc. H_2SO_4
 (b) Calcium formate is heated with calcium acetate
 (c) Glycerol is heated with oxalic acid at $110^\circ C$
 (d) Acetaldehyde is oxidised with $K_2Cr_2O_7$ and H_2SO_4
18. Acetyl chloride cannot be obtained by treating acetic acid with [CPMT 1985]
 (a) $CHCl_3$ (b) $SOCl_2$
 (c) PCl_3 (d) PCl_5
19. o-xylene when oxidised in presence of V_2O_5 the product is
 (a) Benzoic acid (b) Phenyl acetic acid
 (c) Phthalic acid (d) Acetic acid
20. The reaction
 $CH_3CH=CH_3 \xrightarrow[H^+]{CO+H_2O} CH_3-\underset{\substack{| \\ COOH}}{CH}-CH_3$
 is known as [MP PMT 2002]
 (a) Wurtz reactions
 (b) Koch reaction
 (c) Clemenson's reduction
 (d) Kolbe's reaction
21. By aerial oxidation, which one of the following gives phthalic acid [Tamil Nadu CET 2002]
 (a) Naphthalene (b) Benzene
 (c) Mesitylene (d) Toluene



22. $\xrightarrow[\text{(ii) } H_2O]{\text{(i) } CO_2} P$ In the reaction, product P is

[CBSE PMT 2002]



23. Glacial acetic is obtained by [KCET 2002]

- (a) Distilling vinegar
(b) Crystallizing separating and melting acetic acid
(c) Treating vinegar with dehydrating agent
(d) Chemically separating acetic acid

24. In esterification, OH^- ion for making H_2O comes from

[CPMT 1996]

- (a) Acid (b) Alcohol
(c) Ketone (d) Carbohydrate

25. Heating a mixture of ethyl alcohol and acetic acid in presence of conc. H_2SO_4 produces a fruity smelling compound. This reaction is called

[AIIMS 1996]

- (a) Neutralisation (b) Ester hydrolysis
(c) Esterification (d) Williamson's synthesis

26. Product formed by heating a mixture of ammonium chloride and potassium cyanate is

- (a) N_2O (b) NH_3
(c) CH_3NH_2 (d) H_2NCONH_2

27. Rearrangement of an oxime to an amide in the presence of strong acid is called [Kerala CET 2000]

- (a) Curtius rearrangement (b) Fries rearrangement
(c) Backman rearrangement (d) Sandmeyer reaction

28. Which reagent will bring about the conversion of carboxylic acids into esters [CBSE PMT 2000]

- (a) C_2H_5OH (b) Dry $HCl + C_2H_5OH$
(c) $LiAlH_4$ (d) $Al(OC_2H_5)_3$

29. The acid formed when propyl magnesium bromide is treated with carbon dioxide is

[CPMT 1982, 84, 86; Pb. PMT 1998]

- (a) C_3H_7COOH (b) C_2H_5COOH
(c) Both (a) and (b) (d) None of the above

30. CO_2 on reaction with ethyl magnesium bromide gives

[BHU 1983]

- (a) Ethane (b) Propanoic acid
(c) Acetic acid (d) None of these

31. Acetic anhydride is obtained from acetyl chloride by the reaction of

[CPMT 1985, 93]

- (a) P_2O_5 (b) H_2SO_4
(c) CH_3COONa (d) CH_3COOH

32. Hydrolysis of acetamide produces [DPMT 1984; MP PMT 1994; MP PET 2001]

- (a) Acetic acid (b) Acetaldehyde
(c) Methylamine (d) Formic acid

33. Ethyl acetate is obtained when methyl magnesium iodide reacts with [Tamil Nadu CET 2002]

- (a) Ethyl formate (b) Ethyl chloroformate
(c) Acetyl chloride (d) Carbon dioxide

34. Sodium acetate reacts with acetyl chloride to form [BIT 1992]

- (a) Acetic acid (b) Acetone
(c) Acetic anhydride (d) Sodium formate

35. Ammonium acetate reacts with acetic acid at $110^\circ C$ to form [MP PET 1991]

- (a) Acetamide (b) Formamide
(c) Ammonium cyanate (d) Urea

36. Tischenko reaction is used for preparation of

- (a) Ether (b) Ester
(c) Amide (d) Acid anhydride

37. The silver salt of a fatty acid on refluxing with an alkyl halide gives an [KCET 2004]

- (a) Acid (b) Ester
(c) Ether (d) Amine

38. Which reaction is used for the preparation of α -Bromoacetic acid? [MP PET 2004; MP PET/PMT 1998]

- (a) Kolbe's Reaction
(b) Reimer-Tiemann Reaction
(c) Hell volhard Zelinsky Reaction
(d) Perkin's Reaction

39. Tertiary alcohols (3°) having atleast four carbon atoms upon drastic oxidation yield carboxylic acid with [MH CET 2004]

- (a) One carbon atom less
(b) Two carbon atoms less
(c) Three carbon atom less
(d) All the above three options are correct

40. When succinic acid is heated, product formed is [Pb. CET 2000]

- (a) Succinic anhydride (b) Acetic acid
(c) CO_2 and methane (d) Propionic acid

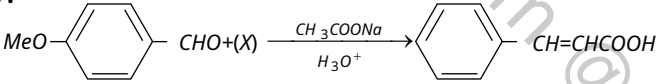
41. In the reaction, $C_6H_5OH \xrightarrow{NaOH} (A) \xrightarrow[140^\circ C, (4-7 \text{ atm})]{CO_2} (B) \xrightarrow{HCl} (C)$, the compound (C) is

[Pb. CET 2001]

- (a) Benzoic acid (b) Salicylaldehyde
(c) Chlorobenzene (d) Salicylic acid

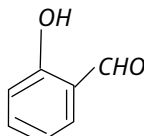
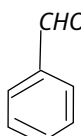
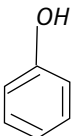
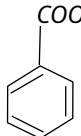
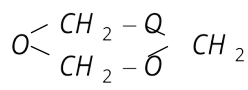
42. When an acyl chloride is heated with Na salt of a carboxylic acid, the product is [DCE 2003]

- (a) An ester (b) An anhydride
(c) An alkene (d) An aldehyde
43. The compound X , in the reaction, is

$$X \xrightarrow{CH_3MgI} Y \xrightarrow{\text{hydrolysis}} Mg(OH)I + CH_3COOH$$
[Pb. CET 2003]
- (a) CH_3CHO (b) CO_2
(c) $(CH_3)_2CO$ (d) $HCHO$
44. $CH_3CONH_2 \xrightarrow{NaNO_2/HCl} X$ **[Pb. CET 2003]**
- (a) CH_3COOH (b) $CH_3CO^+NH_3Cl^-$
(c) CH_3NH_2 (d) CH_3CHO
45. Primary aldehyde on oxidation gives **[DPMT 20004]**
(a) Esters (b) Carboxylic acid
(c) Ketones (d) Alcohols
46. Toluene is oxidised to benzoic acid by **[BHU 2004; CPMT 1985]**
(a) $KMnO_4$ (b) $K_2Cr_2O_7$
(c) H_2SO_4 (d) Both (a) and (b)
47.  **[IIT 2005]**
The compound (X) is
(a) CH_3COOH (b) $BrCH_2-COOH$
(c) $(CH_3CO)_2O$ (d) $CHO-COOH$
48. Salicylic acid is prepared from phenol by **[AFMC 2005]**
(a) Reimer Tiemann reaction
(b) Kolbe's reaction
(c) Kolbe-electrolysis reaction
(d) None of these
49. Acetic acid will be obtained on oxidation of **[J & K 2005]**
(a) Ethanol (b) Propanal
(c) Methanal (d) Glyoxal

Properties of Carboxylic Acids and Their Derivatives

1. Which of the following acids has the smallest dissociation constant **[IIT-JEE (Screening) 2002]**
(a) $CH_3CHFCOOH$ (b) FCH_2CH_2COOH
(c) $BrCH_2CH_2COOH$ (d) $CH_3CHBrCOOH$
2. What is obtained, when propene is treated with *N*-bromo succinimide **[MP PMT 2003]**

$$CH_3 - \underset{\substack{| \\ Br}}{C} = CH_2$$
(a) $BrCH_2 - CH = CH_2$ (b) $BrCH_2 - CH = CH_2$ (c) $BrCH_2 - CH = CHBr$ (d) $BrCH_2 - \underset{\substack{| \\ Br}}{CH} - CH_2Br$
3. What will be the product, when carboxy phenol, obtained by Reimer Tiemann's process, is deoxidised with Zn powder **[MP PMT 2003]**
- (a)  (b) 
(c)  (d) 
4. The vapour of a carboxylic acid HA when passed over MnO_2 at 573 K yields propanone. The acid HA is
(a) Methanoic acid (b) Ethanoic acid
(c) Propanoic acid (d) Butanoic acid
5. Which acid is strongest or Which is most acidic **[CPMT 1982, 89; BIT 1992; MP PET 1996; MP PMT/PET 1988; MP PMT 1995, 97; RPMT 1997]**
(a) $Cl_2CH.COOH$ (b) $ClCH_2COOH$
(c) CH_3COOH (d) $Cl_3C.COOH$
6. Ethyl acetate at room temperature is a
(a) Solid (b) Liquid
(c) Gas (d) Solution
7. Urea is a better fertilizer than ammonium sulphate because
(a) It has greater percentage of nitrogen
(b) It is more soluble
(c) It is weakly basic
(d) It does not produce acidity in soil
8. The reaction of acetamide with water is an example of **[Kurukshetra CEE 1998; RPMT 2000]**
(a) Alcoholysis (b) Hydrolysis
(c) Ammonolysis (d) Saponification
9. The acid which reduces Fehling solution is **[KCET 1998]**
(a) Methanoic acid (b) Ethanoic acid
(c) Butanoic acid (d) Propanoic acid
10.  **[CBSE PMT 1989]**
The above shown polymer is obtained when a carbon compound is allowed to stand. It is a white solid. The polymer is
(a) Trioxane (b) Formose
(c) Paraformaldehyde (d) Metaldehyde
11. What will happen if $LiAlH_4$ is added to an ester

[CBSE PMT 2000]

- (a) Two units of alcohol are obtained
(b) One unit of alcohol and one unit of acid is obtained
(c) Two units of acids are obtained
(d) None of these

12. When anisole is heated with HI , the product is

[CET Pune 1998]

- (a) Phenyl iodide and methyl iodide
(b) Phenol and methanol
(c) Phenyl iodide and methanol
(d) Methyl iodide and phenol

13. When CH_3COOH reacts with $CH_3 - Mg - X$ [BVP 2003]

- (a) CH_3COX is formed (b) Hydrocarbon is formed
(c) Acetone is formed (d) Alcohol is formed

14. Which class of compounds shows H -bonding even more than in alcohols

- (a) Phenols (b) Carboxylic acids
(c) Ethers (d) Aldehydes

15. When propanamide reacts with Br_2 and $NaOH$ then which of the following compound is formed [Manipal 2001]

- (a) Ethyl alcohol (b) Propyl alcohol
(c) Propyl amine (d) Ethylamine

16. Hydrolysis of an ester gives a carboxylic acid which on Kolbe's electrolysis yields ethane. The ester is

[EAMCET 1997; Manipal PMT 2001]

- (a) Ethyl methanoate (b) Methyl ethanoate
(c) Propylamine (d) Ethylamine

17. On prolonged heating of ammonium cyanate or urea, we get [DPMT 1982; CPMT 1979; MP PMT 1996]

- (a) N_2 (b) CO_2
(c) Biurette (d) Ammonium carbonate

18. In the Gabriel's phthalimide synthesis, phthalimide is treated first with

- (a) C_2H_5I / KOH (b) Ethanolic Na
(c) Ethanol and H_2SO_4 (d) Ether and $LiAlH_4$

19. Which of the following is the strongest acid [NCERT 1984]

- (a) CH_3COOH (b) $BrCH_2COOH$
(c) $ClCH_2COOH$ (d) FCH_2COOH

20. Which of the following reduces Tollen's reagent

[MP PMT 1991]

- (a) Acetic acid (b) Citric acid
(c) Oxalic acid (d) Formic acid

21. Oxalic acid may be distinguished from tartaric acid by

- (a) Sodium bicarbonate solution
(b) Ammonical silver nitrate solution

- (c) Litmus paper
(d) Phenolphthalein

22. The reaction of $HCOOH$ with conc. H_2SO_4 gives

[DPMT 1982, CPMT 1989; MP PET 1995; AIIMS 2000; Manipal 2001; Pb. CET 2002]

- (a) CO_2 (b) CO
(c) Oxalic acid (d) Acetic acid

23. Sulphonation of benzoic acid produces mainly [CPMT 1982]

- (a) o -sulphobenzoic acid
(b) m -sulphobenzoic acid
(c) p -sulphobenzoic acid
(d) o - and p -sulphobenzoic acid

24. Which one is strongest acid [MP PMT 1992]

- (a) CH_2FCOOH (b) $CH_2ClCOOH$
(c) $CHCl_2COOH$ (d) CHF_2COOH

25. Which does not give silver mirror with ammoniacal $AgNO_3$

[MP PET 1992]

- (a) $HCHO$ (b) CH_3CHO
(c) CH_3COOH (d) $HCOOH$

26. $2CH_3COOH \xrightarrow[300^\circ C]{MnO} A$, product 'A' in the reaction is

[RPMT 2003]

- (a) CH_3CH_2CHO (b) $CH_3 - CH_2 - OH$
(c) CH_3COCH_3 (d)
 $CH_3 - \overset{\overset{O}{||}}{C} - O - \overset{\overset{O}{||}}{C} - CH_3$

27. Acetic acid is weak acid than sulphuric acid because

[CPMT 2003]

- (a) It decompose on increasing temperature
(b) It has less degree of ionisation
(c) It has $-COOH$ group
(d) None of these

28. In CH_3COOH and $HCOOH$, $HCOOH$ will be

[CPMT 1975; DPMT 1982]

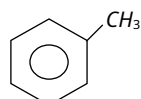
- (a) Less acidic (b) Equally acidic
(c) More acidic (d) None

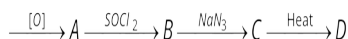
29. Acetic anhydride reacts with excess of ammonia to form

[MP PET 1992]

- (a) $2CH_3COONH_4$
(b) $2CH_3CONH_2$
(c) $CH_3CONH_2 + CH_3COONH_4$
(d) $2CH_3COOH$

30. In the following sequence of reactions, what is D



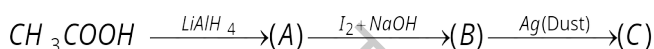


[UPSEAT 2002]

- (a) Primary amine
(b) An amide
(c) Phenyl isocyanate
(d) A chain lengthened hydrocarbon
31. Hydrolytic reaction of fats with caustic soda is known as

[MP PMT/PET 1988; AMU 1988; KCET 2000; MP PET 2001]

- (a) Esterification (b) Saponification
(c) Acetylation (d) Carboxylation
32. In the reaction



the final product (C) is

- (a) C_2H_5I (b) C_2H_5OH
(c) C_2H_2 (d) CH_3COCH_3
33. Reaction of ethyl formate with excess of CH_3MgI followed by hydrolysis gives [IIT (Screening) 1992]
(a) *n*-propyl alcohol (b) Ethanal
(c) Propanal (d) Isopropyl alcohol
34. Of the following four reactions, formic and acetic acids differ in which respect [CPMT 1990, 93]
(a) Replacement of hydrogen by sodium
(b) Formation of ester with alcohol
(c) Reduction of Fehling solution
(d) Blue litmus reaction
35. Formaldehyde and formic acid can be distinguished using [AFMC 1993]
(a) Tollen's reagent (b) Fehling solution
(c) Ferric chloride (d) Sodium bicarbonate
36. Ester and acetamide are distinguished by [BHU 1996]
(a) Hydrolysis with strong acids or alkali
(b) Derivatives of fatty acids
(c) Both (a) and (b)
(d) None of these
37. Acetic acid exists as a dimer in benzene solution. This is due to

[MP PMT 1989; CPMT 1982]

- (a) Condensation
(b) Presence of $-COOH$ group
(c) Presence of α -hydrogen
(d) Hydrogen bonding
38. Which of the following compounds will react with $NaHCO_3$ solution to give sodium salt and carbon dioxide

[CBSE PMT 1999; BHU 1983, 2002]

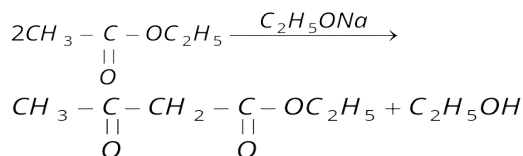
- (a) Phenol (b) *n*-hexanol
(c) Acetic acid (d) Both (a) and (b)

39. Acetic acid dissolved in benzene shows a molecular mass of

[MP PET 1993]

- (a) 30 (b) 60
(c) 120 (d) 240

40. The reaction



is called

[MP PMT 2003; KCET 1996]

- (a) Etard reaction (b) Perkin's reaction
(c) Claisen condensation (d) Claisen Schmidt reaction
41. Which is the strongest acid? (pK_a value is given in the bracket)

[MP PMT 1997; BHU 2003]

- (a) $HCOOH$ (3.77) (b) C_6H_5COOH (4.22)
(c) CH_3COOH (4.71) (d) CH_3CH_2COOH (4.88)

42. In the presence of iodine catalyst, chlorine reacts with acetic acid to form

[MP PMT 1997]

- (a) $CH_3 - \overset{\overset{O}{||}}{C} - Cl$ (b) $CH_2Cl - \overset{\overset{O}{||}}{C} - OH$
(c) $CH_3 - \overset{\overset{Cl}{|}}{C} - OH$ (d) $CH_3 - \overset{\overset{O}{||}}{C} - O - Cl$

43. The acid showing salt-like character in aqueous solution is

[MP PET/PMT 1998]

- (a) Acetic acid (b) Benzoic acid
(c) Formic acid (d) α -amino acetic acid

44. $CH_3COOH \xrightarrow[P_2O_5]{\Delta} X$. Identify X

[JIPMER 2000; CPMT 2003]

- (a) CH_3COCH_3 (b) CH_3CHO
(c) $(CH_3CO)_2O$ (d) CH_4

45. Formic acid [MP PET/PMT 1988]

- (a) Is immiscible with water
(b) Reduces the ammonical silver nitrate
(c) Is a weak acid nearly three and a half times weaker than acetic acid
(d) Is prepared by heating potassium hydroxide

46. Given below are some statements concerning formic acid, which of them is true [CPMT 1983]

- (a) It is a weaker acid than acetic acid
(b) It is a reducing agent
(c) When its calcium salt is heated, it forms a ketone
(d) It is an oxidising agent
47. Which decolourises the colour of acidic $KMnO_4$ [CPMT 1991]
(a) CH_3COOH (b) CH_3CH_2COOH
(c) $COOH.COOH$ (d) $CH_3COOC_2H_5$
48. A colourless water soluble organic liquid decomposes sodium carbonate and liberates carbon dioxide. It produces black precipitate with Tollen's reagent. The liquid is [KCET 1989]
(a) Acetaldehyde (b) Acetic acid
(c) Formaldehyde (d) Formic acid
49. The end product B in the sequence of reactions
 $R-X \xrightarrow{CN^-} A \xrightarrow{NaOH} B$ is [CPMT 1985]
(a) An alkane
(b) A carboxylic acid
(c) Sodium salt of carboxylic acid
(d) A ketone
50. $CH_3CH_2COOH \xrightarrow{Cl_2/Fe} X \xrightarrow[KO_4]{Alcoholic} Y$
Compound Y is [DPMT 1981; JIPMER 2000; AIEEE 2002]
(a) CH_3CH_2OH (b) CH_3CH_2CN
(c) $CH_2=CHCOOH$ (d) $CH_3CHClCOOH$
51. In the precipitation of soap, which can be used instead of $NaCl$ [CPMT 1979]
(a) Na (b) CH_3COONa
(c) Na_2SO_4 (d) Sodium silicate
52. Which of the following can possibly be used as analgesic without causing addiction and moon modification [CBSE PMT 1997]
(a) Morphine
(b) N -acetyl-para-aminophenol
(c) Drazepam
(d) Tetrahydrocannabinol
53. Which of the following esters cannot undergo Claisen self condensation [CBSE PMT 1998]
(a) $CH_3-CH_2-CH_2-CH_2-COOC_2H_5$
(b) $C_6H_5COOC_2H_5$
(c) $C_6H_5CH_2COOC_2H_5$
(d) $C_6H_{11}CH_2COOC_2H_5$
54. When acetic acid is dissolved in benzene its molecular mass [AFMC 1991]
(a) Decreases
(b) Increases
(c) Either increases or decreases
(d) Suffers no change
55. Benzoic acid has higher molecular weight in benzene and less in water because
(a) Water has lower freezing point and higher boiling point than benzene
(b) It dissociates to a greater extent in benzene than in water
(c) It associates in water and dissociates in benzene
(d) It dissociates in water and associates in benzene
56. What is the main reason for the fact that carboxylic acids can undergo ionization [MNR 1993; Pb. PMT 2004]
(a) Absence of α -hydrogen
(b) Resonance stabilisation of the carboxylate ion
(c) High reactivity of α -hydrogen
(d) Hydrogen bonding
57. Which of the following compounds will evolve hydrogen on treatment with metal [CPMT 1974]
(a) C_2H_5OH (b) CH_3COOH
(c) (a) and (b) both (d) None of these
58. When urea is heated, it forms biurette, alkaline solution of which forms with $CuSO_4$ solution [AFMC 1980]
(a) Violet colour (b) Red colour
(c) Green colour (d) Black colour
59. Which of the following would be expected to be most highly ionised in water [AIIMS 1982]
(a) $CH_2ClCH_2CH_2COOH$ (b) $CH_3CHCl.CH_2.COOH$
(c) $CH_3.CH_2.CCl_2.COOH$ (d) $CH_3.CH_2.CHCl.COOH$
60. Alkaline hydrolysis of esters is known as [CPMT 1986, 88, 93; MNR 1986; MP PET 1993]
(a) Saponification (b) Hydration
(c) Esterification (d) Alkalisiation
61. Which of the following undergoes hydrolysis when dissolved in water [CPMT 1989]
(a) CH_3COONa (b) CH_3CONH_2
(c) Both (a) and (b) (d) $C_6H_5CH_3$
62. Name the end product in the following series of reactions
 $CH_3COOH \xrightarrow{NH_3} A \xrightarrow[P_2O_5]{\Delta} B$ [DPMT 1984]
(a) CH_4 (b) CH_3OH
(c) Acetonitrile (d) Ammonium acetate

63. Reduction of carboxylic acids gives
 (a) Alcohol with hydrogen in presence of palladium
 (b) Alcohol with $LiAlH_4$
 (c) Aldehyde with $LiAlH_4$
 (d) Alcohol with $2HI(P)$
64. Which of the following substances when boiled with caustic soda solution will evolve ammonia [BHU 1983]
 (a) Ethylamine (b) Aniline
 (c) Acetamide (d) Acetoxime
65. $CH_2 = CH - (CH_2)_5COOH \xrightarrow[HBr]{Peroxide} Z$
 where Z is [CPMT 1996]
 (a) $CH_3 - \underset{\substack{| \\ Br}}{CH} - (CH_2)_5COOH$
 (b) $BrCH_2 - (CH_2)_6COOH$
 (c) $CH_2 = CH - (CH_2)_5 - CH_2OH$
 (d) C_6H_5COOH
66. $HCOOH$ shows all tests of aldehyde because [CPMT 1996]
 (a) It has one aldehyde group
 (b) It is member of aldehyde
 (c) All acids show tests of aldehyde
 (d) Does not show any test
67. Which one of the following orders of acid strength is correct [CBSE PMT 2003]
 (a) $RCOOH > HC \equiv CH > HOH > ROH$
 (b) $RCOOH > ROH > HOH > HC \equiv CH$
 (c) $RCOOH > HOH > ROH > HC \equiv CH$
 (d) $RCOOH > HOH > HC \equiv CH > ROH$
68. The order of decreasing rate of reaction with ammonia is [Pb. PMT 1998]
 (a) Anhydrides, esters, ethers
 (b) Anhydrides, ethers, esters
 (c) Ethers, anhydrides, esters
 (d) Esters, ethers, anhydrides
69. Oxidation of toluene with CrO_3 in the presence of $(CH_3CO)_2O$ gives a product 'A' which on treatment with aqueous $NaOH$ produces [CBSE PMT 1995]
 (a) C_6H_5CHO (b) $(C_6H_5CO)_2O$
 (c) C_6H_5COONa (d) 2, 4-diacetyl toluene
70. $CH_3COOCH_3 + \text{excess } PhMgBr$

$\rightarrow \text{product} \xrightarrow{H^+} X$

The product X is

[Orissa JEE 2005]

- (a) 1, 1-diphenylethanol
 (b) 1, 1-diphenylmethanol
 (c) Methyl phenylethanol
 (d) Methyl phenylketone

71. Which of the following is most acidic [MP PMT 1995]

- (a) Formic acid (b) Chloroacetic acid
 (c) Propionic acid (d) Acetic acid

72. Urea on slow heating gives

- (a) $NH_2CON.HNO_2$ (b) $NH_2CONHCONH_2$
 (c) $HCNO$ (d) $NH_2CONH_2.HNO_3$

73. The principal organic product formed in the following reaction is

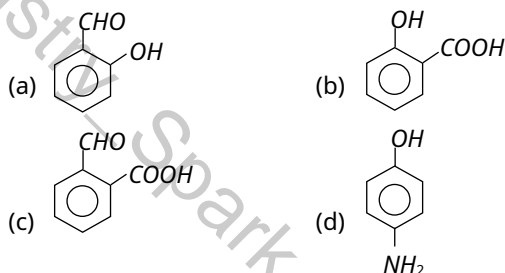


[Pb. PMT 1998]

- (a) $CH_3CHBr(CH_2)_8COOH$
 (b) $CH_2 = CH(CH_2)_8COBr$
 (c) $CH_2BrCH_2(CH_2)_8COOH$
 (d) $CH_2 = CH(CH_2)_7CHBrCOOH$

74. Which one of the following compound gives aspirin on reacting with acetic anhydride in presence of H_2SO_4

[EAMCET 2003]



75. An acyl halide is formed when PCl_5 reacts with an

[CBSE PMT 1994; AIIMS 1998; CBSE PMT 2002]

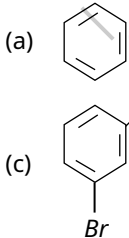
- (a) Acid (b) Alcohol
 (c) Amide (d) Ester

76. Which one of the following orders is wrong with respect to the property indicated [CBSE PMT 1994]

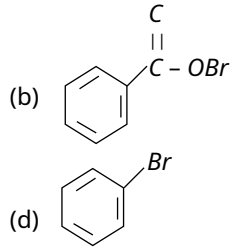
- (a) Formic acid > acetic acid > propanoic acid (acid strength)
 (b) Fluoroacetic acid > chloroacetic acid > bromoacetic acid (acid strength)
 (c) Benzoic acid > phenol > cyclohexanol (acid strength)

- (d) Aniline > cyclohexylamine > benzamide (basic strength)
77. A fruity smell is produced by the reaction of C_2H_5OH with
[AFMC 2000]
(a) PCl_5 (b) CH_3COCH_3
(c) CH_3COOH (d) None of these
78. Which of the following orders of relative strengths of acids is correct
[CPMT 2000]
(a) $FCH_2COOH > ClCH_2COOH > BrCH_2COOH$
(b) $ClCH_2COOH > BrCH_2COOH > FCH_2COOH$
(c) $BrCH_2COOH > ClCH_2COOH > FCH_2COOH$
(d) $ClCH_2COOH > FCH_2COOH > BrCH_2COOH$
79. When acetamide is treated with $NaOBr$, the product formed is
[Haryana CEET 2000]
(a) CH_3CN (b) $CH_3CH_2NH_2$
(c) CH_3NH_2 (d) None of the above
80. The fatty acid which shows reducing property is
[Kerala CET 2000]
(a) Acetic acid (b) Ethanoic Acid
(c) Oxalic acid (d) Formic acid
81. The reagent that can be used to distinguish between methanoic acid and ethanoic acid is
[Kerala CET 2001, 02]
(a) Ammoniacal silver nitrate solution
(b) Neutral ferric Chloride solution
(c) Sodium carbonate solution
(d) Phenolphthalein
82. Hydrolysis of an ester gives acid A and alcohol B. A reduces Fehling solution and oxidation of B gives A. The ester is
[MP PMT 1999]
(a) Methyl formate (b) Ethyl formate
(c) Methyl acetate (d) Ethyl acetate
83. Order of reactivity is
[RPMT 2003]
(a) $R-\overset{O}{\underset{||}{C}}-X > RCONH_2 > RCOOCOR > RCOOR$
(b) $RCOX > RCOOCOR > RCOOR > RCONH_2$
(c) $RCOOR > RCONH_2 > RCOX > RCOOCOR$
(d) $RCOOCOR > RCOOR > RCOX > RCONH_2$
84. Right order of acidic strength is
[RPMT 2003]
(a) $CH_2ClCOOH > HCOOH > C_2H_5COOH > CH_3COOH$
(b) $CH_2ClCOOH > HCOOH >$
- $CH_3COOH > C_2H_5COOH$
(c) $C_2H_5COOH > CH_3COOH > HCOOH > CH_2ClCOOH$
(d) $HCOOH > CH_2ClCOOH > CH_3COOH > C_2H_5COOH$
85. Saponification of ethyl benzoate with caustic soda as alkali gives
[Kerala (Med.) 2001]
(a) Benzyl alcohol and ethanoic acid
(b) Sodium benzoate and ethanol
(c) Benzoic acid and sodium ethoxide
(d) Phenol and ethanoic acid
(e) Sodium benzoate and ethanoic acid
86. Lactic acid on oxidation by alkaline potassium permanganate gives
[Tamil Nadu CET 2002]
(a) Tartaric acid (b) Pyruvic acid
(c) Cinnamic acid (d) Propionic acid
87. $RCOOH \longrightarrow RCH_2OH$
This mode of reduction of an acid to alcohol can be affected only by
[CBSE PMT 1989]
(a) Zn/HCl
(b) Na -alcohol
(c) Aluminium isopropoxide and isopropyl alcohol
(d) $LiAlH_4$
88. Which one of the following compounds forms a red coloured solution on treatment with neutral $FeCl_3$ solution
[EAMCET 2003]
(a) CH_3COCH_3 (b) CH_3OCH_3
(c) CH_3CH_2OH (d) CH_3COOH
89. Urea can be tested by
[UPSEAT 1999; BVP 2003]
(a) Benedict test (b) Mullicken test
(c) Ninhydrin (d) Biuret test
90. What are the organic products formed in the following reaction
[IIT 1995]
$$C_6H_5-COO-CH_3 \xrightarrow[2. H_2O]{1. LiAlH_4}$$

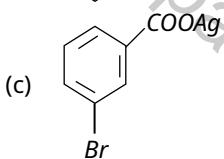
(a) C_6H_5-COOH and CH_4
(b) $C_6H_5-CH_2-OH$ and CH_4
(c) $C_6H_5-CH_3$ and CH_3-OH
(d) $C_6H_5-CH_2-OH$ and CH_3-OH
91. Reaction between an acid and alcohol will give
[Roorkee 1995]
(a) Higher C containing acid (b) Secondary alcohol
(c) Alkane (d) Ester
92. Benzoic acid gives benzene on being heated with X and phenol gives benzene on being heated with Y. Therefore X and Y are respectively
[CBSE PMT 1992]
(a) Sodalime and copper (b) Zn dust and $NaOH$
(c) Zn dust and sodalime (d) Sodalime and zinc dust

93. The product obtained when acetic acid is treated with phosphorus trichloride is [CPMT 1989, 93, 94; RPMT 1997; AIIMS 1998; EAMCET 1998]
 (a) $CH_3COOPCl_3$ (b) CH_3COOCl
 (c) CH_3COCl (d) $ClCH_2COOH$
94. Acetyl chloride is reduced with $LiAlH_4$ the product formed is [SCRA 1990]
 (a) Methyl alcohol (b) Ethyl alcohol
 (c) Acetaldehyde (d) Acetone
95. In the preparation of an ester, the commonly used dehydrating agent is [KCET 1992]
 (a) Phosphorus pentoxide
 (b) Anhydrous calcium carbide
 (c) Anhydrous aluminium chloride
 (d) Concentrated sulphuric acid
96. In the esterification reaction of alcohols [KCET 1984]
 (a) OH^- is replaced by C_6H_5OH
 (b) H^+ is replaced by sodium metal
 (c) OH^- is replaced by chlorine
 (d) OH^- is replaced by CH_3COO^- group
97. Lower carboxylic acids are soluble in water due to [MP PET 1999]
 (a) Low molecular weight (b) Hydrogen bonding
 (c) Dissociation into ions (d) Easy hydrolysis
98. Acetamide reacts with P_2O_5 (phosphorus pentaoxide) to give [AFMC 1997]
 (a) Methyl cyanide (b) Methyl cyanate
 (c) Ethyl cyanide (d) Ethyl isocyanate
99. The reaction $CH_3COOH + Cl_2 \xrightarrow{P} ClCH_2COOH + HCl$ is called [NSE 2001; MP PET 2003]
 (a) Hell-Volhard-Zelinsky reaction
 (b) Birch reaction
 (c) Rosenmund reaction
 (d) Hunsdiecker reaction
100. An aqueous solution of urea [CPMT 1983]
 (a) Is neutral
 (b) Is acidic
 (c) Is basic
 (d) Can act as an acid and a base
101. Nitration of benzoic acid gives [MP PMT 1997]
 (a) 3-nitrobenzoic acid (b) 2-nitrobenzoic acid
 (c) 2, 3-dinitrobenzoic acid (d) 2, 4-dinitrobenzoic acid
102. The reagent used for converting ethanoic acid to ethanol is [KCET 1996; EAMCET 1998]
 (a) $LiAlH_4$ (b) $KMnO_4$
 (c) PCl_3 (d) $K_2Cr_2O_7 / H^+$
103. Which one of the following has the maximum acid strength [NCERT 1983]
 (a) *o*-nitrobenzoic acid (b) *m*-nitrobenzoic acid
 (c) *p*-nitrobenzoic acid (d) *p*-nitrophenol
104. When benzoic acid is treated with PCl_5 at $100^\circ C$, it gives [Orissa JEE 2003]
 (a) Benzoyl chloride (b) *o*-chlorobenzoic acid
 (c) *p*-chlorobenzoic acid (d) Benzyl chloride
105. Oxalic acid on being heated upto $90^\circ C$ with conc. H_2SO_4 forms [AFMC 1989; MP PET 1994; MP PMT 1989]
 (a) $HCOOH + CO_2$ (b) $CO_2 + H_2O$
 (c) $CO_2 + CO + H_2O$ (d) $HCOOH + CO$
106. Benzoic acid is less acidic than salicylic acid because of [Bihar MEE 1997]
 (a) Hydrogen bond (b) Inductive effect
 (c) Resonance (d) All of these
 (e) None of these
107. Lactic acid on heating with conc. H_2SO_4 gives [MP PET 1996]
 (a) Acetic acid (b) Propionic acid
 (c) Acrylic acid (d) Formic acid
108. Acetamide is [MP PET 1990; RPMT 1999]
 (a) Acidic (b) Basic
 (c) Neutral (d) Amphoteric
109. Silver benzoate reacts with bromine to form [KCET 1996]
- 

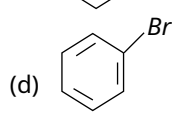
(a)

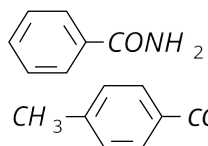


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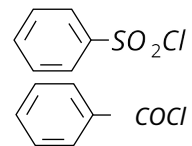


(c)



(d)
110. Acetic anhydride reacts with diethyl ether in presence of anhydrous $AlCl_3$ to form [MP PMT 1992]
 (a) Ethyl acetate (b) Methyl propionate
 (c) Methyl acetate (d) Propionic acid
111. Treatment of benzoic acid with $Cl_2 / FeCl_3$ will give [KCET 1998; CET Pune 1998]
 (a) *p*-chlorobenzoic acid (b) *o*-chlorobenzoic acid
 (c) 2, 4-dichlorobenzoic acid (d) *m*-chlorobenzoic acid
112. Hinsberg's reagent is [MP PMT 2003]
- 

(a)



(b)

- (a) (b)
(c) (d)
113. Which of the following is the correct order of increasing strengths of carboxylic acids
(a) $\text{CH}_2\text{FCOOH} < \text{CH}_3\text{COOH}$
 $< \text{CH}_2\text{ClCOOH} < \text{CCl}_3\text{COOH}$
(b) $\text{CH}_3\text{COOH} < \text{CH}_2\text{ClCOOH}$
 $< \text{CH}_2\text{FCOOH} < \text{CCl}_3\text{COOH}$
(c) $\text{CH}_2\text{ClCOOH} < \text{CH}_2\text{FCOOH}$
 $< \text{CCl}_3\text{COOH} < \text{CH}_3\text{COOH}$
(d) $\text{CCl}_3\text{COOH} < \text{CH}_2\text{ClCOOH}$
 $< \text{CH}_2\text{FCOOH} < \text{CH}_3\text{COOH}$

114. The weakest acid among the following is
[CPMT 1976, 82, 89; BHU 1982; CBSE PMT 1991;
MP PMT 1989; Roorkee 1992; RPET 1999]

- (a) CH_3COOH (b) Cl_2CHCOOH
(c) ClCH_2COOH (d) Cl_3CCOOH

115. Consider the acidity of the carboxylic acids

- (a) PhCOOH (b) $o\text{-NO}_2\text{C}_6\text{H}_4\text{COOH}$
(c) $p\text{-NO}_2\text{C}_6\text{H}_4\text{COOH}$ (d) $m\text{-NO}_2\text{C}_6\text{H}_4\text{COOH}$

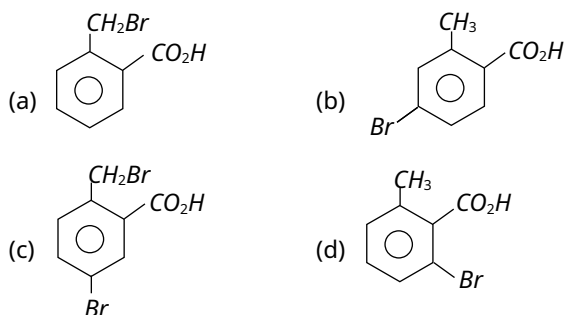
Which of the following order is correct? [AIEEE 2004]

- (a) $b > d > a > c$ (b) $b > d > c > a$
(c) $a > b > c > d$ (d) $b > c > d > a$

116. On mixing ethyl acetate with aqueous sodium chloride, the composition of the resultant solution is
[AIEEE 2004]

- (a) $\text{CH}_3\text{COCl} + \text{C}_2\text{H}_5\text{OH} + \text{NaOH}$
(b) $\text{CH}_3\text{COONa} + \text{C}_2\text{H}_5\text{OH}$
(c) $\text{CH}_3\text{COOC}_2\text{H}_5 + \text{NaCl}$
(d) $\text{CH}_3\text{Cl} + \text{C}_2\text{H}_5\text{COONa}$

117. *o*-Toluic acid on reaction with $\text{Br}_2 + \text{Fe}$, gives [AIIMS 2004]



118. The reaction of an ester RCOO R' with an alcohol R''OH in the presence of an acid gives [Kerala PMT 2004]

- (a) RCOOH (b) R'COOH
(c) R''COOR (d) RCOO R''
(e) R'COO R''

119. RCOOH on treatment with PCl_5 and KCN , is subjected to hydrolysis followed by Clemmensen's reduction, the product obtained is [Kerala PMT 2004]

- (a) $\text{RCH}_2\text{-COCl}$ (b) $\text{RCH}_2\text{-COOH}$
(c) RCOCN (d) RCN
(e) R-OH

120. The reagent which does not give acid chloride on treating with a carboxylic acid is [KCET 2004]

- (a) PCl_5 (b) Cl_2
(c) SOCl_2 (d) PCl_3

121. An organic compound is boiled with alcoholic potash. The product is cooled and acidified with HCl . A white solid separates out. The starting compound may be [KCET 2004]

- (a) Ethyl benzoate (b) Ethyl formate
(c) Ethyl acetate (d) Methyl acetate

122. The OH group of an alcohol or the -COOH group of a carboxylic acid can be replaced by -Cl using [CBSE PMT 2004]

- (a) Chlorine
(b) Hydrochloric acid
(c) Phosphorus pentachloride
(d) Hypochlorous acid

123. Which of the following is most acidic [MP PET 2004]

- (a) Picric acid (b) *p*-nitrophenol
(c) *m*-nitrophenol (d) *o-p* dinitrophenol

124. Benedict's solution is not reduced by [CPMT 2004]

- (a) Formaldehyde (b) Acetaldehyde
(c) Glucose (d) Acetic anhydride

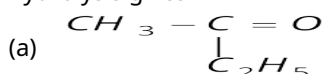
125. CH_3COOH is reacted with $\text{CH} \equiv \text{CH}$ in presence of Hg^{++} , the product is [DPMT 2004; BHU 1998]

- $\text{CH}_3(\text{OOCCH}_3)$
(a) $\text{CH}_2(\text{OOCCH}_3)$ (b) CH_3
 $\text{CH}_2-(\text{OOC}-\text{CH}_3)$
(c) CH_3
 $\text{CH}(\text{OOC}-\text{CH}_3)_2$ (d) None of these

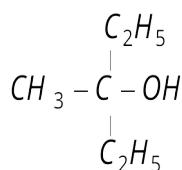
126. Acetic acid reacts with PCl_5 to form [Pb. CET 2001]

- (a) CH_3COCl (b) CHCl_2COOH
(c) CH_2ClCOOH (d) CH_3COCl

127. $CH_3COOC_2H_5$ with excess of C_2H_5MgBr and hydrolysis gives [MH CET 2004]



(b)

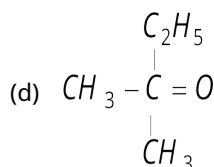
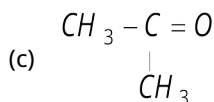


(a)

(b)

(c)

(d)



128. Urea upon hydrolysis yields [Pb. CET 2001]

- (a) Acetamide (b) Carbonic acid
(c) Ammonium hydroxide (d) NO_2

129. $CH_3CHO \xrightarrow{HCN} A \xrightarrow{HOH} B$. The product B is

[Pb. CET 2003]

- (a) Malonic acid (b) Glycolic acid
(c) Lactic acid (d) Malic acid

130. What is the % of acetic acid present in vinegar?

[AFMC - 2004; MH CET 2003; CPMT 1974, 75]

- (a) 6 – 10% (b) 70 – 80%
(c) 7 – 8% (d) 90 – 100%

131. Fruity smell is given by

[MH CET 2004]

- (a) Esters (b) Alcohols
(c) Chloroform (d) Acid anhydrides

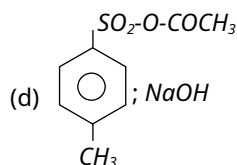
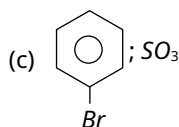
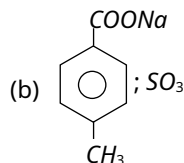
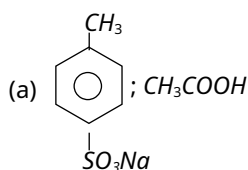
132. Lactic acid molecule has

[MH CET 2004]

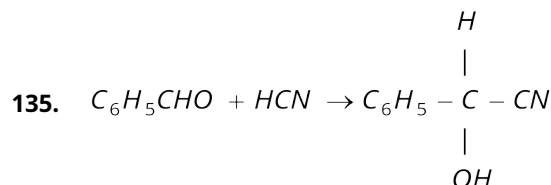
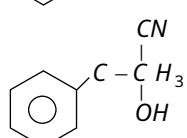
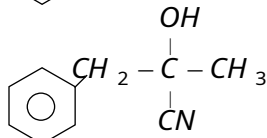
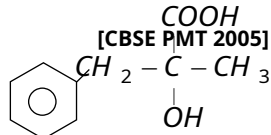
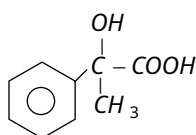
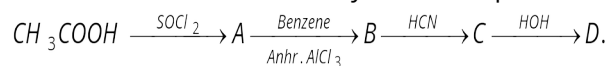
- (a) One chiral carbon atom
(b) Two chiral carbon atoms
(c) No chiral carbon atom
(d) As asymmetric molecule

133. 4-methyl benzene sulphonic acid reacts with sodium acetate to give

[IIT-JEE (Screening) 2005]



134. In a set reactions acid yielded a product D



The product would be

[Pb. PMT 1998]

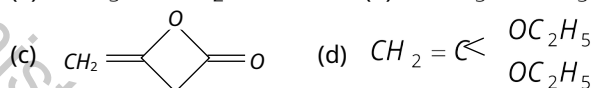
- (a) A racemate
(b) Optically active
(c) A meso compound
(d) A mixture of diastereomers

136. What happens when 2-hydroxy benzoic acid is distilled with zinc dust, it gives [MP PET/PMT 1998]

- (a) Phenol (b) Benzoic acid
(c) Benzaldehyde (d) A polymeric compound

137. $CH_3CO_2C_2H_5$ on reaction with sodium ethoxide in ethanol gives A, which on heating in the presence of acid gives B compound B is [AIIMS 2005]

- (a) CH_3COCH_2COOH (b) CH_3COCH_3



138. $C_6H_5CONHCH_3$ can be converted into $C_6H_5CH_2NHCH_3$ by [AIIMS 2005]

- (a) $NaBH_4$ (b) $H_2 - Pd / C$
(c) $LiAlH_4$ (d) $Zn - Hg / HCl$

139. Among the following acids which has the lowest pK_a value

[AIEEE 2005]

- (a) CH_3COOH (b) $HCOOH$
(c) $(CH_3)_2CH - COOH$ (d) CH_3CH_2COOH

140. X is heated with soda lime and gives ethane. X is

[AFMC 2005]

- (a) Ethanoic acid (b) Methanoic acid
(c) Propanoic acid (d) Either (a) or (c)

141. Which of the following is an amphoteric acid [KCET 2005]

- (a) Glycine (b) Salicylic acid
(c) Benzoic acid (d) Citric acid

142. Colouration of Br_2 / CCl_4 will be discharged by

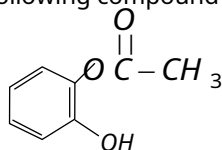
[Orissa JEE 2005]

- (a) Cinnamic acid (b) Benzoic acid

- (c) *o*-phthalic acid (d) Acetophenone
143. Order of hydrolysis for the following
 (I) $RCOCl$ (II) $RCOOR$
 (III) $RCONH_2$ (IV) $(RCO)_2O$ [DPMT 2005]
- (a) $I > IV > II > III$ (b) $I > II > III > IV$
 (c) $I > III > II > IV$ (d) $IV > III > II > I$
144. If the enolate ion combines with carbonyl group of ester, we get [DPMT 2005]
 (a) Aldol (b) α, β -unsaturated ester
 (c) β -keto aldehyde (d) Acid
145. Which of the following compounds will react with $NaHCO_3$ solution to give sodium salt and carbon dioxide [DPMT 2005]
 (a) Acetic acid (b) *n*-hexanol
 (c) Phenol (d) Both (a) and (c)
146. A carboxylic acid is converted into its anhydride using [J & K 2005]
 (a) Thionyl chloride (b) Sulphur chloride
 (c) Sulphuric acid (d) Phosphorus pentoxide

Uses of Carboxylic Acids and Their Derivatives

1. The following compound is used as



[KCET 1996]

- (a) An anti-inflammatory agent
 (b) Analgesic
 (c) Hypnotic
 (d) Antiseptic
2. To which of the following groups does soap belongs [NCERT 1979; RPET 2000]
 (a) Esters
 (b) Amines
 (c) Salts of organic higher fatty acids
 (d) Aldehydes
3. Aspirin is an acetylation product of [CBSE PMT 1998]
 (a) *o*-hydroxybenzoic acid (b) *o*-dihydroxybenzene
 (c) *m*-hydroxybenzoic acid (d) *p*-dihydroxybenzene
4. Which one is used as a food preservative [MP PET 1989; KCET 1999]
 (a) Sodium acetate (b) Sodium propionate
 (c) Sodium benzoate (d) Sodium oxalate
5. What makes a lemon sour [CPMT 1972; CBSE PMT 1991; RPET 1999]
 (a) Tartaric acid (b) Oxalic acid
 (c) Citric acid (d) Hydrochloric acid

6. The reagent used for protection of amino group during the nitration of aniline is [JIPMER 1997]
 (a) $SOCl_2$ / Pyridine (b) PCl_5
 (c) Acetic acid (d) Acetic anhydride

Critical Thinking

Objective Questions

1. Ethyl ester $\xrightarrow[\text{excess}]{CH_3MgBr}$ P . The product P will be [IIT-JEE 2003]
- (a)
- (b)
- (c)
- (d)
2. Hydrogenation of $C_6H_5CHOH - COOH$ over $Rh - Al_2O_3$ catalyst in methanol gives [Roorkee Qualifying 1998]
 (a) $C_6H_5CH_2COOH$ (b) $C_6H_{11}CHOHCOOH$
 (c) $C_6H_5CHOHCH_2OH$ (d) $C_6H_{11}CH_2COOH$
3. Which of the following has the most acidic proton [Roorkee Qualifying 1998]
 (a) CH_3COCH_3 (b) $(CH_3)_2C=CH_2$
 (c) $CH_3COCH_2COCH_3$ (d) $(CH_3CO)_3CH$
4. In the anion $HCOO^-$ the two carbon-oxygen bonds are found to be of equal length. What is the reason for it
 (a) Electronic orbitals of carbon atom are hybridised
 (b) The $C=O$ bond is weaker than the $C-O$ bond
 (c) The anion $HCOO^-$ has two resonating structures
 (d) The anion is obtained by removal of a proton from the acid molecule
5. An organic compound of molecular formula $C_4H_{10}O$ does not react with sodium. With excess of

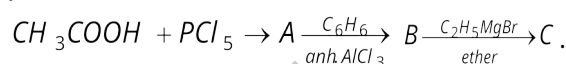
HI, it gives only one type of alkyl halide. The compound is [SCRA 2001]

- (a) Ethoxyethane (b) 2-Methoxypropane
(c) 1-Methoxypropane (d) 1-Butanol

6. When $CH_2 = CH - COOH$ is reduced with $LiAlH_4$, the compound obtained will be [AIIEE 2003]

- (a) $CH_3 - CH_2 - COOH$ (b) $CH_2 = CH - CH_2OH$
(c) $CH_3 - CH_2 - CH_2OH$ (d) $CH_3 - CH_2 - CHO$

7. In a set of the given reactions, acetic acid yielded a product C



Product C would be [CBSE PMT 2003]

- (a) $CH_3 - \overset{\overset{C_2H_5}{|}}{C}(OH)C_6H_5$ (b) $CH_3CH(OH)C_2H_5$
(c) $CH_3COC_6H_5$ (d) $CH_3CH(OH)C_6H_5$

8. Carboxylic acids are more acidic than phenol and alcohol because of [Tamil Nadu CET 2001]

- (a) Intermolecular hydrogen bonding
(b) Formation of dimers
(c) Highly acidic hydrogen
(d) Resonance stabilization of their conjugate base

9. $R - CH_2 - CH_2OH$ can be converted into RCH_2CH_2COOH . The correct sequence of the reagents is [AIIMS 1997]

- (a) PBr_3, KCN, H_3O^+ (b) PBr_3, KCN, H_2
(c) HCN, PBr_3, H^+ (d) KCN, H^+

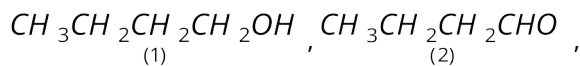
10. When propionic acid is treated with aqueous sodium bicarbonate CO_2 is liberated. The 'C' of CO_2 comes from [IIT-JEE (Screening) 1999]

- (a) Methyl group (b) Carboxylic acid group
(c) Methylene group (d) Bicarbonate

11. Benzoyl chloride is prepared from benzoic acid by [IIT-JEE (Screening) 2000]

- (a) Cl_2, hv (b) SO_2Cl_2
(c) $SOCl_2$ (d) Cl_2, H_2O

12. Identify the correct order of boiling points of the following compounds



(1) (2) (3) [IIT-JEE (Screening) 2002]

- (a) $1 > 2 > 3$ (b) $3 > 1 > 2$
(c) $1 > 3 > 2$ (d) $3 > 2 > 1$

13. The compound not soluble in acetic acid is [UPSEAT 2003; IIT-JEE 1986]

- (a) $CaCO_3$ (b) CaO
(c) CaC_2O_4 (d) $Ca(OH)_2$

14. The *ortho/para* directing group among the following is [AIIMS 2003]

- (a) $COOH$ (b) CN
(c) $COCH_3$ (d) $NHCOCH_3$

15. Iodoform test is not given by [BHU 1995]

- (a) Acetone (b) Ethyl alcohol
(c) Acetic acid (d) None of these

16. How will you convert butan-2-one to propanoic acid [IIT-JEE (Screening) 2005]

- (a) Tollen's reagent (b) Fehling's solution
(c) $NaOH / I_2 / H^+$ (d) $NaOH / NaI / H^+$

17. Which of the acids cannot be prepared by Grignard reagent [MH CET 2004]

- (a) Acetic acid (b) Succinic acid
(c) Formic acid (d) All of these

R Assertion & Reason

For AIIMS Aspirants

Read the assertion and reason carefully to mark the correct option out of the options given below :

- (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
(c) If assertion is true but reason is false.
(d) If the assertion and reason both are false.
(e) If assertion is false but reason is true.

1. Assertion : Carboxylic acid exist as dimer.
Reason : Carboxylic acid shows hydrogen bonding.
2. Assertion : Trichloroacetic acid is stronger than acetic acid.
Reason : Electron withdrawing substituents decrease the activity.

3. Assertion : First four aliphatic monocarboxylic acids are colourless.
Reason : Carboxylic acids with more than five carbon atoms are insoluble in water.
4. Assertion : Carboxylic acids do not give characteristic reactions of carbonyl group.
Reason : Carboxylic acids exist as cyclic dimers in solid, liquid and even in vapour state.
5. Assertion : Pure acetic acid is converted into ice like solid called glacial acetic acid.
Reason : Acetic acid is stronger than HCOOH .
6. Assertion : The second dissociation constant of maleic acid is greater than fumaric acid.
Reason : Higher the dissociation constant of acid more is acidic character.
7. Assertion : Lower acids on reacting with strong electropositive metals give effervescences of H_2 .
Reason : $\text{MeCOOC}_4\text{H}_9$ hydrolyses rapidly than MeCOOCH_3 .
8. Assertion : Melting point of carboxylic acids shows a regular pattern.
Reason : Carboxylic acids are reduced to alkanes on reduction with HI in presence of red phosphorus.
9. Assertion : Electron withdrawing groups decrease the acidity of carboxylic acids.
Reason : Substituents affect the stability of the conjugate base and acidity of carboxylic acids.
10. Assertion : Fluoroacetic acid is stronger acid than bromoacetic acid.
Reason : Acidity depends upon the electron withdrawing effects of the fluorine and chlorine.
11. Assertion : Aminoacetic acid is less acidic than acetic acid.
Reason : Amino group is electron donating in nature.
12. Assertion : Carboxylic acids have higher boiling points than alkanes.
Reason : Carboxylic acids are resonance hybrids.
13. Assertion : Both formic acid and oxalic acid decolourize KMnO_4 solution.

Reason : Both are easily oxidised to CO_2 and H_2O .

14. Assertion : Esters which contain α -hydrogens undergo Claisen condensation.

Reason : LiAlH_4 reduction of esters gives acids.

Answers

General Introduction of Carboxylic Acids and Their Derivatives

1	d	2	d	3	c	4	d	5	a
6	c	7	d	8	c	9	c	10	d
11	a	12	c	13	d	14	d	15	b
16	c	17	d	18	d	19	c	20	b,d
21	a	22	a	23	c	24	b	25	b
26	b	27	c	28	d	29	a	30	a
31	c	32	b	33	d	34	c	35	a
36	d	37	a	38	d				

Preparation of Carboxylic Acids and Their Derivatives

1	d	2	a	3	a	4	c	5	c
6	a	7	a	8	c	9	a	10	b
11	d	12	a	13	b	14	d	15	a
16	c	17	c	18	a	19	c	20	b
21	a	22	b	23	b	24	a	25	c
26	d	27	c	28	b	29	a	30	b
31	c	32	a	33	b	34	c	35	a
36	b	37	b	38	c	39	b	40	a
41	d	42	b	43	b	44	a	45	b
46	d	47	c	48	a	49	a		

Properties of Carboxylic Acids and Their Derivatives

1	c	2	b	3	d	4	b	5	d
6	b	7	ad	8	b	9	a	10	a
11	a	12	d	13	b	14	b	15	d
16	b	17	c	18	a	19	d	20	d
21	b	22	b	23	b	24	d	25	c

26	c	27	b	28	c	29	c	30	c
31	b	32	c	33	d	34	c	35	d
36	c	37	d	38	c	39	c	40	c
41	a	42	b	43	d	44	c	45	b
46	b	47	c	48	d	49	c	50	c
51	c	52	b	53	b	54	b	55	d
56	b	57	c	58	a	59	c	60	a
61	c	62	c	63	b	64	c	65	b
66	a	67	c	68	b	69	c	70	a
71	b	72	b	73	c	74	b	75	a
76	d	77	c	78	a	79	c	80	d
81	a	82	a	83	b	84	b	85	b
86	b	87	d	88	d	89	d	90	d
91	d	92	d	93	c	94	b	95	d
96	d	97	b	98	a	99	a	100	a
101	a	102	a	103	a	104	a	105	c
106	a	107	c	108	d	109	d	110	a
111	d	112	b	113	b	114	a	115	d
116	c	117	c	118	d	119	b	120	b
121	a	122	c	123	a	124	d	125	c
126	a	127	b	128	b	129	c	130	a
131	a	132	a	133	a	134	a	135	b
136	b	137	c	138	d	139	b	140	c
141	a	142	a	143	a	144	c	145	a
146	d								

Uses of Carboxylic Acids and Their Derivatives

1	b	2	c	3	a	4	c	5	c
6	d								

Critical Thinking Questions

1	a	2	b	3	d	4	c	5	a
6	b	7	a	8	d	9	a	10	d
11	c	12	b	13	c	14	d	15	c
16	c	17	c						

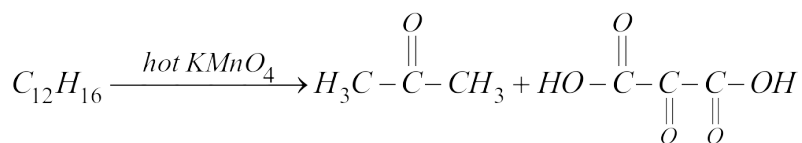
Assertion & Reason

1	a	2	c	3	c	4	b	5	c
6	e	7	c	8	e	9	e	10	a
11	c	12	b	13	a	14	c		

ALDEHYDES & KETONES

Integer answers type questions:

1.



(A)

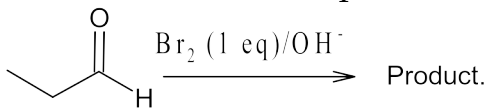
(1mole)

(2mole)

(2mole)

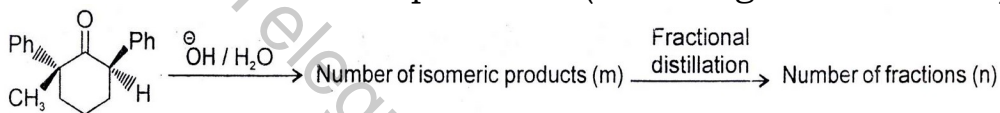
Number of π bonds present in A.

2.



Find the total number of products. (Including stereoisomers)

3.



The value of (m + n) is

4.

How many of the following will give faster rate of cyanohydrins formation than benzaldehyde?

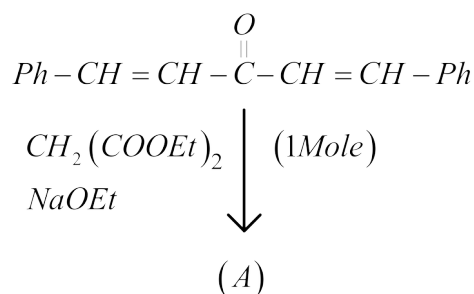
(a) p-methoxy benzaldehyde

(b) p-cyano benzaldehyde

(c) p-nitrobenzaldehyde

(d) p-methylbenzaldehyde

5.



(Six membered ring)

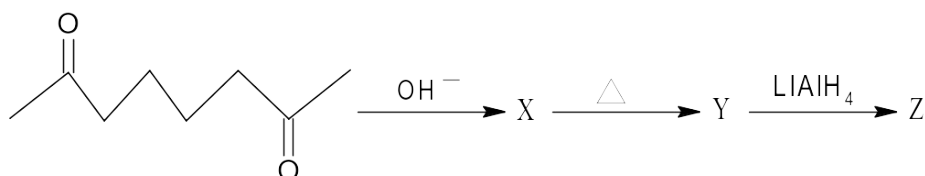
How many oxygen atoms are present in (A) ?

6.

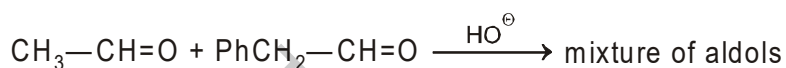
10 moles of $CH_3 - \overset{\overset{O}{\parallel}}{C} - CH_2 - \overset{\overset{O}{\parallel}}{C} - CH_3$ are treated with 8 moles of CH_3MgBr followed by hydrolysis. How many moles of diol will be obtained?

7.

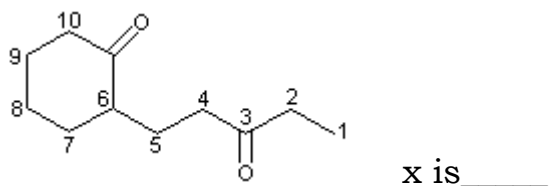
How many carbon - carbon double bonds are present in the end product, Z?



8. How many number of possible condensation products are obtained when propanal and propanone are together treated with moderately concentrated alkali?
9. A compound (A) of molecular formula $C_{14}H_{10}O_{12}$ is formed from $C_{14}H_{14}O_2$ by oxidation $Cr_2O_7^{2-}$. (A) upon treatment with OH^- gives (B) on treatment with conc. H_2SO_4 and heat gives compound (C) of molecular formula $C_{28}H_{20}O_4$ (B) responds to $NaHCO_3$ test and effervescence comes out. What should be the molecular wt. of B?
10. $C_8H_6O_2$ on reaction with conc. $NaOH$ undergoes a redox reaction to yield (A) which on treatment with $KMnO_4/H^+$ followed by $HaOH/CaO$ gives an aromatic compound (X). Calculate the mol. mass of aromatic compound (X).

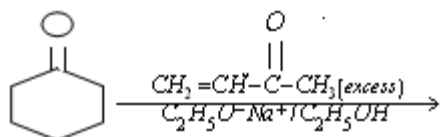


11. (z) total number of aldols including stereoisomers
12. Total number of aldol products obtained by involving reaction between CH_3CH_2CHO and CH_3CHO
13. Acetone on treatment with dry HCl gives W. The number of sp^2 carbons in W are _____
14. In the following compound which numbered carbon atom enters into intramolecular aldol condensation to give major product

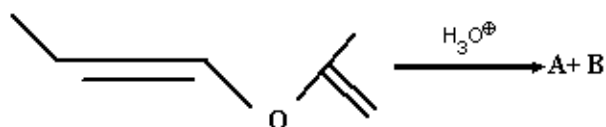


15. product.

Number of isomeric hydrazone products in above reaction is/are _____



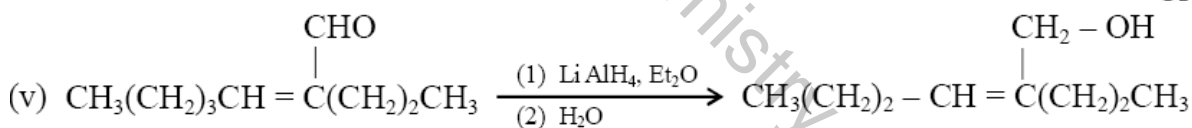
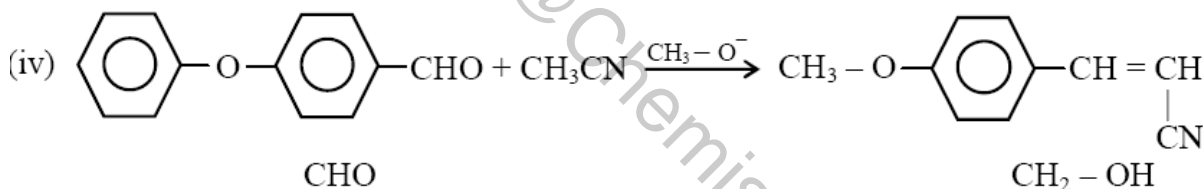
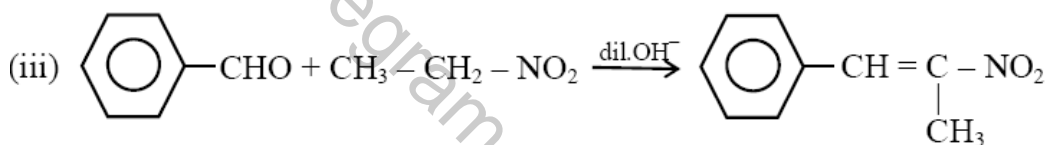
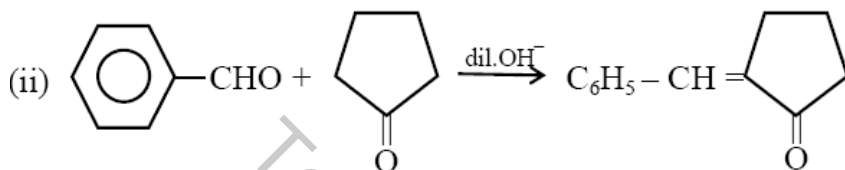
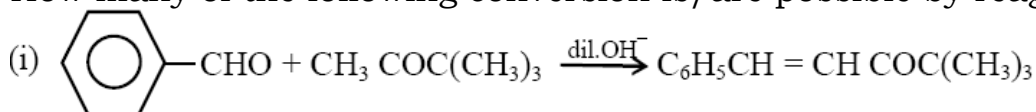
16. The number of moles of α, β - unsaturated ketone react with cyclohexanone are.....
17. When acetone is treated with conc. HCl , the number of acetone molecules required to form phorone is.....



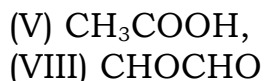
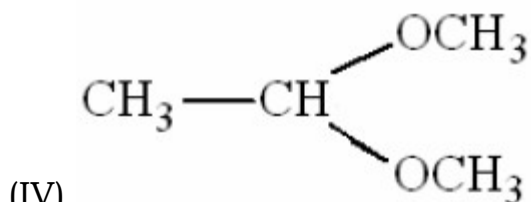
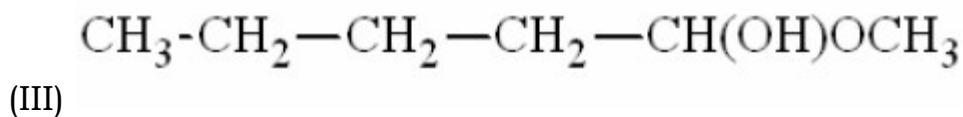
18. compounds A & B can be differentiated by how many of the following reagents?

Brady's Reagent ; Fehlings Solution ; Hinsberg Reagent ;
 CaOCl_2 ; NaOI ; NaHSO_3 ; Tollen's Reagent

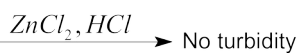
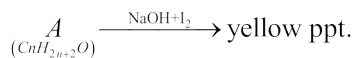
19. An organic compound (A) $\text{C}_x\text{H}_6\text{O}_2$ was treated with I_2 / NaOH consumes 6 moles of I_2 to produce iodoform and a dibasic acid (B) which when treated with alkaline KMnO_4 , pink color of KMnO_4 gets decolorized with no organic compound left as residue. The minimum value of X is.
20. How many of the following conversion is/are possible by reagent indicated.



21. How many of the following compounds would give a positive Tollen's test?



22.



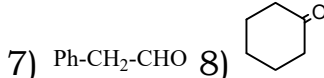
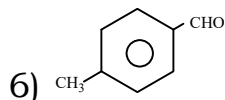
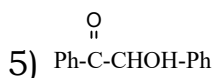
Find the value of n for the organic compound A.

23. The no. of compounds undergo self Aldol condensation is

- I) Methanal II) Ethanal III) Benzene carbaldehyde IV) Propanone
V) 2, 2-dimethyl propanal VI) Propenal VII) Phenyl ethanal VIII) Cyclohexanone

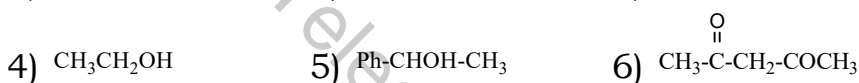
24. The number of compounds give positive Fehling test

- 1) $\text{CH}_3\text{-CHO}$ 2) $\text{CH}_3\text{-CH}_2\text{-CHO}$ 3) Ph-CHO 4) CH_3COCH_3



25. The no. of compounds give the Iodoform Test

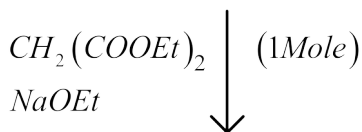
- 1) $\text{CH}_3\text{-CHO}$ 2) CH_3COCH_3 3) $\text{CH}_3\text{-CH}_2\text{-CO-CH}_2\text{-CH}_3$



26. 1 mole SBH reduces 'y' moles acetaldehyde to ethyl alcohol. The value of 'y' is

27. The number of organic compounds out of the following which can show positive iodoform test is

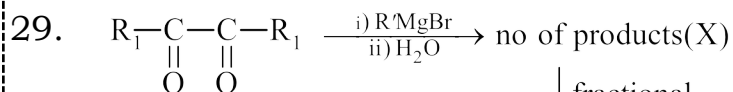
Acetaldehyde, methanal, Butanone, Acetone, Glyoxal, Pentan-2-one



(A)

(Six membered ring)

How many oxygen atoms are present in (A) ?

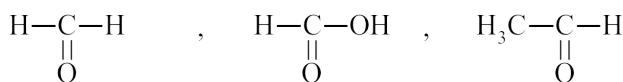
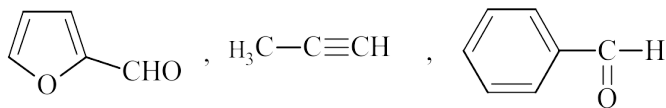


fractional
distillation

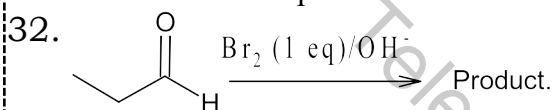
No of fractions (Y)

value of X + Y would be

30. Among the following how many of them reduce Tollen's reagent and give Ag mirror test?



31. Find the minimum no. of carbon atoms in aldehyde required to produce stereoisomeric aldol product.



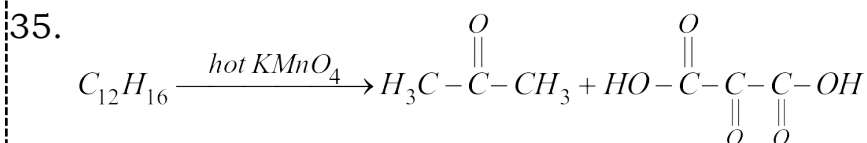
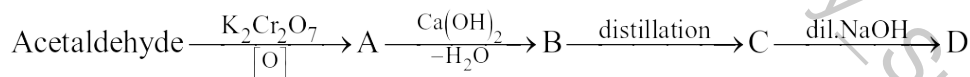
Find the total number of products. (Including stereoisomers)

33. How many of the following will give faster rate of cyanohydrins formation than

benzaldehyde?

- (a) p-methoxy benzaldehyde (b) p-cyano benzaldehyde
(c) p-nitrobenzaldehyde (d) p-methylbenzaldehyde

34. Number of carbon atoms in the compound D is



(A)

(1mole)

(2mole)

(2mole)

Number of π bonds present in A.

36. How many vacant hybrid orbitals are involved in formation of banana bonds in diborane structure.

ALDEHYDES & KETONES – KEY SHEET

Integer Answers

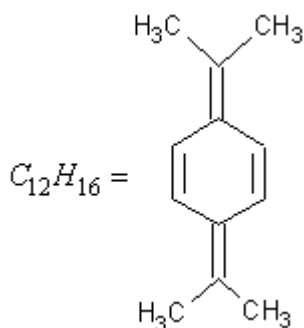
1	4	2	2	3	4	4	2	5	5	6	0
7	1	8	4	9	144	10	72	11	12	12	4
13	5	14	2	15	2	16	4	17	3	18	4
19	4	20	4	21	7	22	2	23	4	24	4
25	6	26	4	27	4	28	5	29	5	30	6
31	2	32	2	33	2	34	6	35	4	36	3

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ALDEHYDES & KETONES – SOLUTIONS

Integer solutions

1.



2.

2

3.

Pair of diastereomers is formed (m), therefore, two fractions are obtained

4.

2

5.

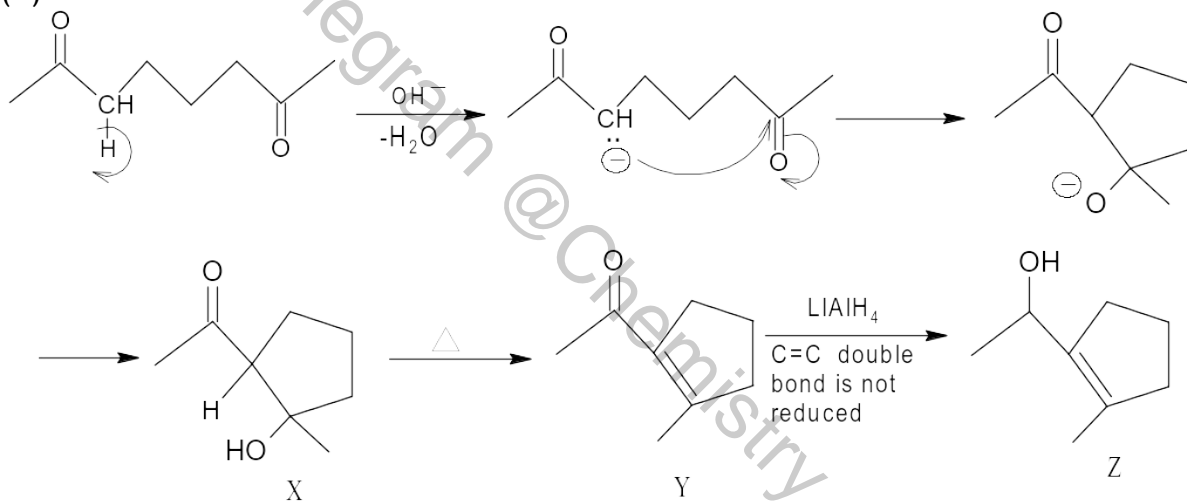
Double Michael Addition

6.

Because of acidic hydrogen of $-CH_2-$ group 8 moles of CH_4 will be obtained.

7.

(1)

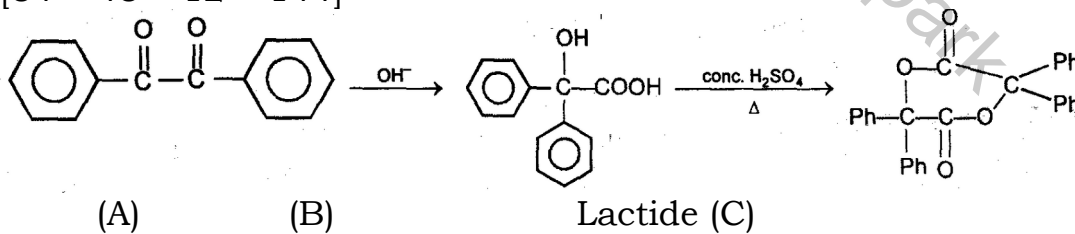


8.

Fact.

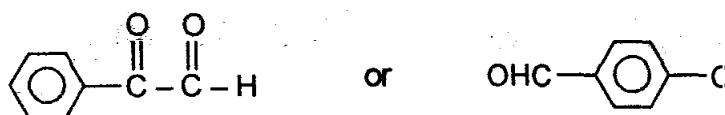
9.

$$[84 + 48 + 12 = 144]$$

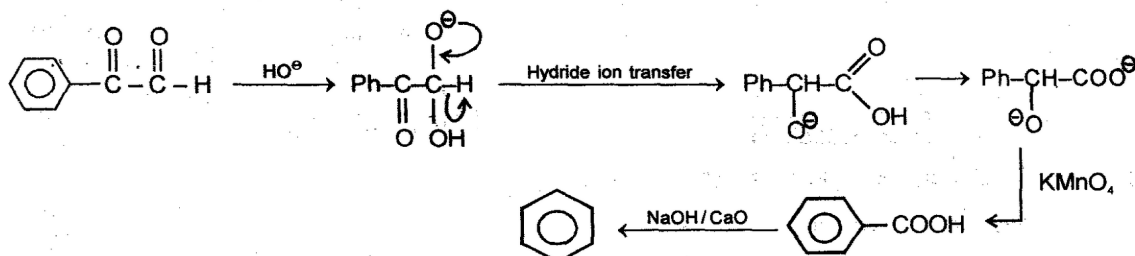


10.

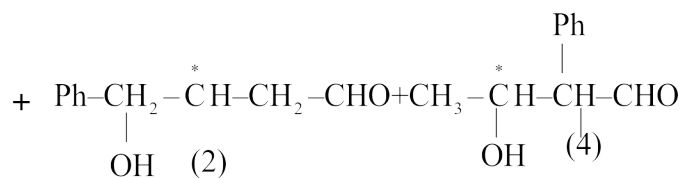
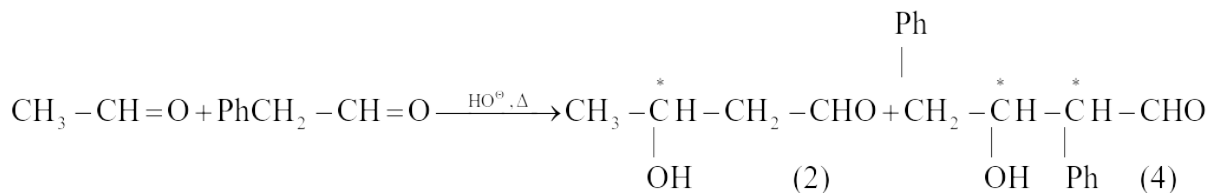
72



Internal Cannizaro



11. 12



12. Conceptual

13. Acetone forms Phorone with dry HCl

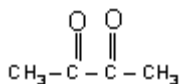
14. C₂ carbon is involved in internal Aldol condensation

15. Forms two oxines. (E and Z)

16. 4- α H atoms are present

17. 3 molecules condense

18. A & B are propionaldehyde and propanone



19. A is

20. 4

21. 7

22. 2

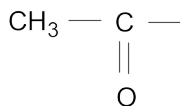
23. Conceptual

24. Conceptual

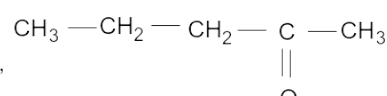
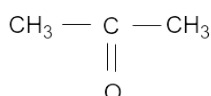
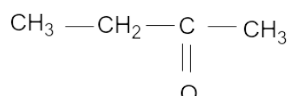
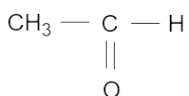
25. Conceptual

26. Conceptual

27. Copounds containing



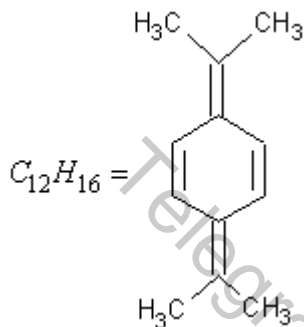
under go iodoform reaction



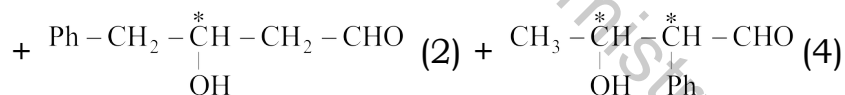
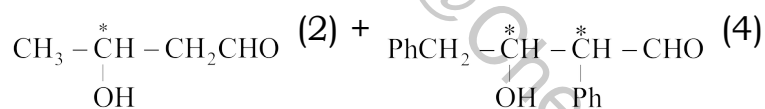
28. Double Michael Addition

$$\begin{array}{c} R_1 \\ | \\ R' - \text{C} - \text{OH} \\ | \\ \text{HO} - \text{C} - R' \\ | \\ R_1 \end{array}$$

35.



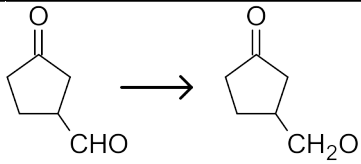
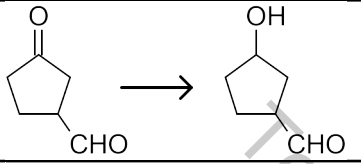
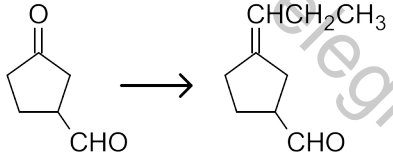
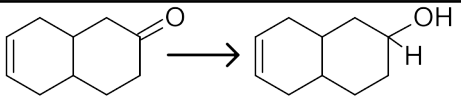
Total 12 isomers



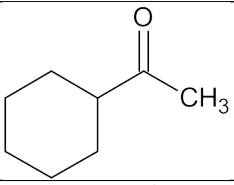
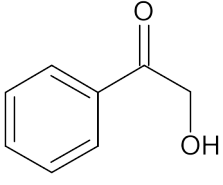
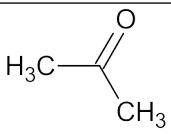
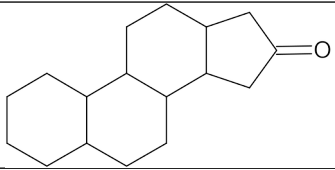
ALDEHYDES & KETONES

Matching answer type questions:

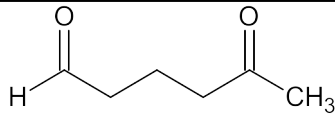
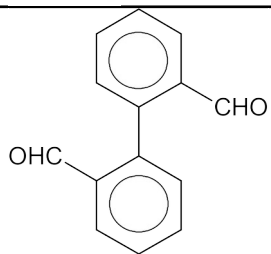
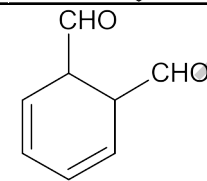
1. Match the Following:

Column I (Mixture)		Column II (pH) (under adiabatic free expansion)	
(a)		(p)	CH_2OH (i) $\begin{array}{c} \\ CH_2OH \end{array}$ (ii) $Ph_3P = CH Et$
(b)		(q)	$NaBH_4$
(c)		(r)	CH_2-OH (i) $KMnO_4$, (ii) $\begin{array}{c} \\ CH_2-OH \end{array}$ (iii) $LiAlH_4$, (iv) H_3O^+
(d)		(s)	CH_2-OH i) $\begin{array}{c} \\ CH_2-OH \end{array}$ ii) $NaBH_4$, iii) H_3O^+

2. Match the Following:

COLUMN - I		COLUMN - II	
(A)		(P)	Gives reddish brown precipitate with $CuSO_4$ /sodium potassium tartrate solution
(B)		(Q)	Shows tautomerism
(C)		(R)	Gives two isomeric compounds with hydrazine hydrochloride
(D)		(S)	Gives yellow precipitate with $I_2/NaOH$

3. Match the Following:

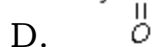
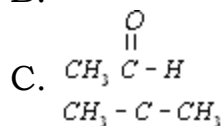
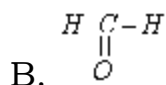
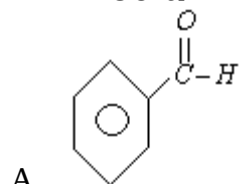
Column I (Compound)		Column II (Reaction / test shown by the compound)	
(a)		(p)	Tollen's Test
(b)	$(CHO)_2$	(q)	Fehling's Test
(c)		(r)	Intramolecular Cannizzaro's reaction
(d)		(s)	Intramolecular aldol condensation
		(t)	Haloform Test

4. Match the Following:

Column I		Column II	
(a)	$C_6H_5 - CN \xrightarrow[HCl]{SnCl_2}$	(p)	$C_6H_5 - CH = NH.HCl$
(b)	$H - C \begin{matrix} \diagup O - C_2H_5 \\ O - C_2H_5 \\ \diagdown O - C_2H_5 \end{matrix} \xrightarrow[H_3O^+]{C_6H_5MgCl}$	(q)	$C_6H_5 - CH(OC_2H_5)_2$
(c)	$C_6H_5 - \overset{\overset{O}{ }}{C} - CH_3 \xrightarrow{\text{Peracid}}$	(r)	$CH_3 - \overset{\overset{O}{ }}{C} - O - C_6H_5$
(d)	$C_6H_5 - OH + CH_3COCl \xrightarrow{NaOH}$	(s)	$C_6H_5 - CHO$
		(t)	$CH_3 - O - \overset{\overset{O}{ }}{C} - C_6H_5$

5.

Column - I



Column - II

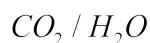
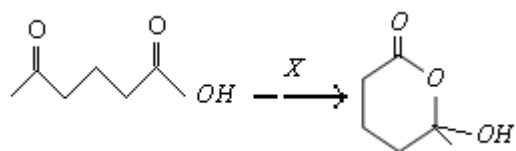
P. Haloform

Q. Ceric ammonium nitrate

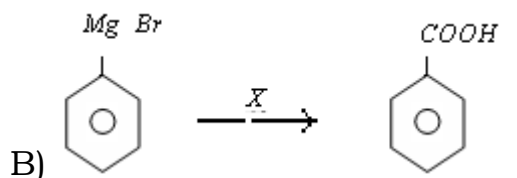
R. Cannizzaro's reaction

S. Aldol condensation

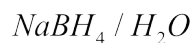
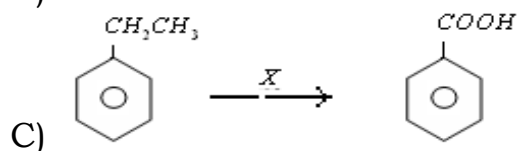
6. Column – I Column – II (X may be)



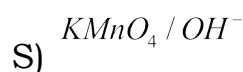
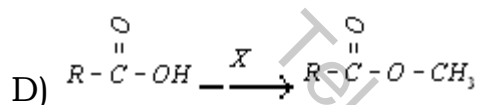
P)



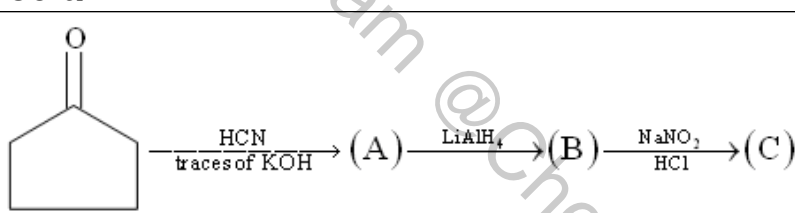
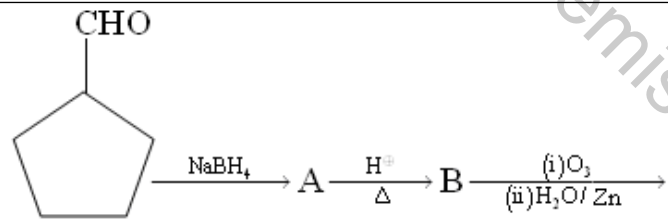
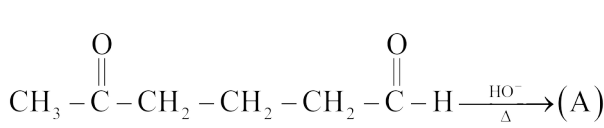
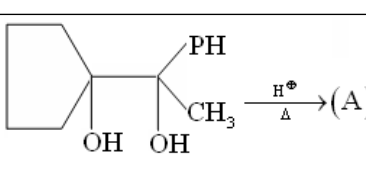
Q)



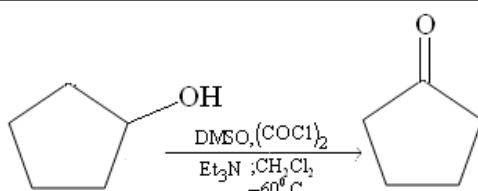
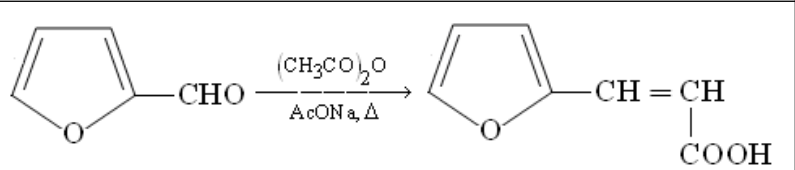
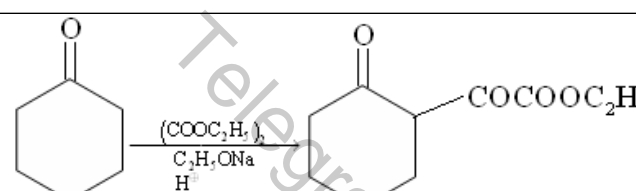
R)



7. Match the column (I) and Column (II). (Matrix)

	Column I		Column II
(A)		(p)	Formation of six member ring takes place
(B)		(q)	Final product is Ketone
(C)		(r)	Final product will give positive Tollen's test
(D)		(s)	Final product will react with 2,4-DNP. (2,4-Di-nitrophenyl hydrazine)

8. Match the following

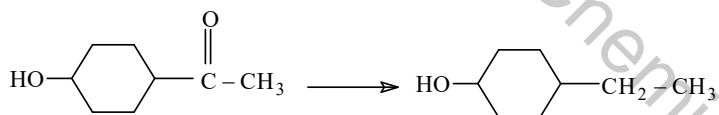
	Column I		Column II
(A)		(p)	Aldol condensation
(B)	$\text{C}_6\text{H}_5\text{CHO} \xrightarrow[\text{OH}^-]{\text{CH}_3\text{CHO}} \text{C}_6\text{H}_5\text{CH}=\text{CHCHO}$	(q)	Perkins reaction
(C)		(r)	Swern oxidation
(D)		(s)	Cross Claisen condensation

9.

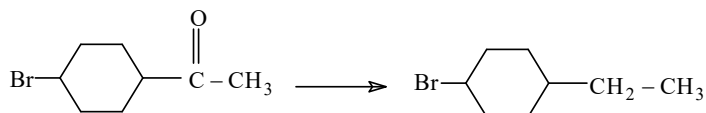
List – I

a) $\text{R} - \text{X} \rightarrow \text{R} - \text{H}$

b)



c)



d) $\text{RCOOH} \rightarrow \text{RCOCH}_3$

List – II

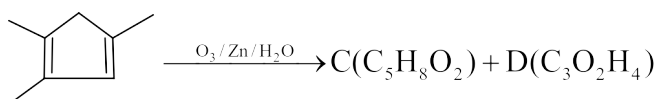
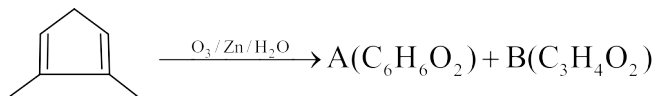
p) $\text{Zn} - \text{Hg} / \text{conc. HCl}$

q) CH_3Li

r) Bu_3SnH

s) $\text{NH}_2 - \text{NH}_2 / \text{OH}^-$

10.



Match the following :

Column I

(A) A can give / gives

(B) B can give / gives

(C) C can give / gives

Column II

(P) Haloform reaction

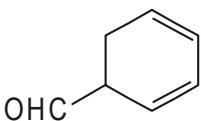
(Q) 1 mole of haloform

(R) 2 mole of haloform

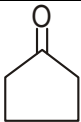
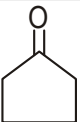
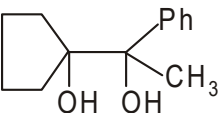
(D) D can give / gives

(S) Aldol condensation
(either inter or intramolecular)

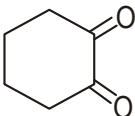
11. Match the Following:

COLUMN - I		COLUMN - II	
(A)	$\text{Ph}-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}=\text{CH}_2$	(P)	1, 4-addition
(B)		(Q)	Tautomerism
(C)	$\text{CH}_3-\text{CH}=\text{CH}-\text{CH}=\text{CH}_2$	(R)	$\text{AgNO}_3/\text{NH}_4\text{OH}$
(D)	$\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{H}$	(S)	2,4 DNP test

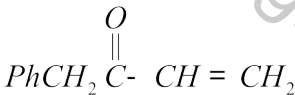
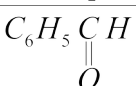
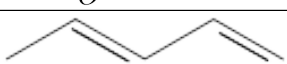
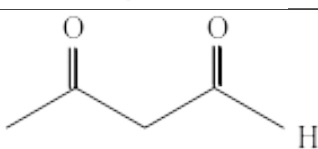
12. Match the Following:

COLUMN - I		COLUMN - II	
(A)  $\xrightarrow{\text{NaCN} + \text{H}_2\text{SO}_4}$ (A) $\xrightarrow{\text{LiAlH}_4}$	(P)	Formation of six member ring take place	
(B) $\xrightarrow{\text{HNO}_2}$ Product			
(B)  $\xrightarrow{\text{NH}_2\text{OH}}$ (A) $\xrightarrow{\text{H}^+}$ (B) $\xrightarrow{\text{LiAlH}_4}$ Product	(Q)	Final product is ketone	
(C) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{H} \xrightarrow[\Delta]{\text{OH}^-}$ Product	(R)	Final product formed will give positive tollen's test	
(D)  $\xrightarrow[\Delta]{\text{H}^+}$ Product	(S)	Final product will react with 2, 4 DNP	

13. Match the Following:

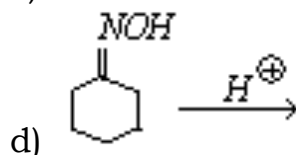
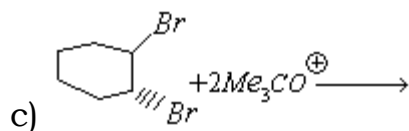
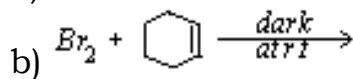
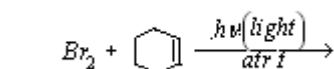
COLUMN - I		COLUMN - II	
(A) $\text{Ph}-\text{C}(=\text{O})-\text{H} \xrightarrow{\text{alkaline KCN}}$ Product	(P)	Final product formed give positive tollen test	
(B)  $\xrightarrow[(2) \text{H}^+]{(1) \text{OH}^-}$ Product	(Q)	Final product give test with 2, 4 DNP	
(C) $\text{CH}_3-\text{C}(=\text{O})-\text{OEt} \xrightarrow[(2) \text{H}_3\text{O}^+, \Delta]{(1) \text{C}_2\text{H}_5\text{ONa}}$ Product	(R)	Final product react with NaOCO_3 and liberated CO_2 gas	
(D) $\text{Ph}-\text{CH}=\text{O} \xrightarrow[(2) \text{H}^+]{(1) \text{KOH}}$ Product	(S)	Final product react with Na and liberated H_2 gas	

14. Match the Column -I with Column -II

Column - I		Column - II	
(A)		(p)	1,4 - addition
(B)		(q)	Tautomerism
(C)		(r)	$\text{AgNO}_3/\text{NH}_4\text{OH}$
(D)		(s)	2, 4-DNP test

15. Column (Reactions) - I
(Type of reaction)

Column - II



p) Beckmann rearrangement

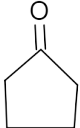
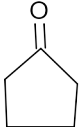
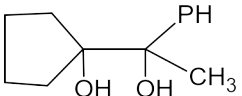
q) Double eliminations

r) Radical substitution

s) Addition

16. Match the column I and II



(Column I)	(Column II)
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(A)	 $\xrightarrow[\text{traces of KOH}]{\text{HCN}}$ (A) $\xrightarrow{\text{LiAlH}_4}$ (B) $\xrightarrow[\text{HCl}]{\text{NaNO}_2}$ (C)	(p)	Formation of six member ring takes place
(B)	 $\xrightarrow{\text{NH}_2\text{OH}}$ (A) $\xrightarrow{\text{H}^+}$ (B) $\xrightarrow{\text{LAH}}$ (C)	(q)	Final product is ketone
(C)	$\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3 \xrightarrow[\triangle]{\text{HO}^-}$ (A)	(r)	Final product formed will give positive Tollen's test
(D)	 $\xrightarrow[\triangle]{\text{H}^+}$ (A)	(s)	Final product formed will react with 2, 4-DNP. (2, 4-Di-nitrophenyl hydrazine)

17. Match the column-I, column-II

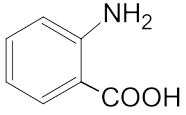

Column I (Mixture)	Column II (pH)
(A) Acid catalysed dehydration of an aldol	(p) E ₁ CB
(B) Base catalysed dehydration of an aldol	(q) E ₁
(C) Acid catalysed dehydration of alcohol	(r) E ₂
(D) Dehydration of alcohol by POCl ₃ in pyridine	(s) E ₁ + E ₂

18. Match the following column – I with column – II

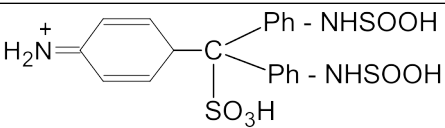
Column – I	Column– II
(A)  + Ph ₃ P = CHMe \longrightarrow Product	(p) Three membered cyclic intermediate
(B) $\text{H}_2\text{C}=\text{CH}-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{H} \xrightarrow{\triangle}$ Product	(q) six-membered cyclic intermediate
(C) 2-Butene + Br ₂ \longrightarrow Product	(r) Carbocation
(D)  $\xrightarrow[\triangle]{\text{AlCl}_3, \text{CS}_2}$ Product	(s) Four membered cyclic intermediate.

19. Match the following column – I with column – II

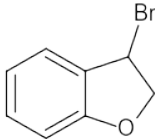
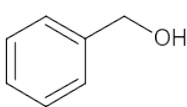
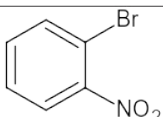
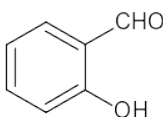
Column (I)	Column (II)
(A) $\text{CH}_2 = \text{C} = \text{CH}_2 \xrightarrow{\text{H}_3\text{O}^+}$	(p) carbocation

(B) 	$\xrightarrow[\text{(ii) Base/ } \Delta]{\text{(i) NaNO}_2 + \text{HCl}}$	(q) 1,1-elimination carbene
(C) $\text{CH}_3-\underset{\text{OH}}{\text{CH}}-\text{CH}_2-\text{CHO}$	$\xrightarrow[\Delta]{\text{OH}^-}$	(r) $\text{E}_{\text{CB}}1$
(D) 	$\xrightarrow[\Delta]{\text{CHCl}_3/\text{OH}^-}$	(s) benzyne

20. Match the chemical compounds in column I with the reagents used to test them in column II. Indicate your answer by darkening the appropriate bubbles of the 4×4 matrix given in the ORS.

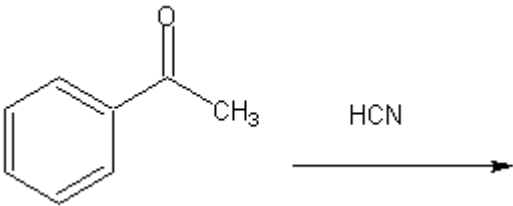
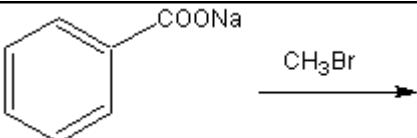
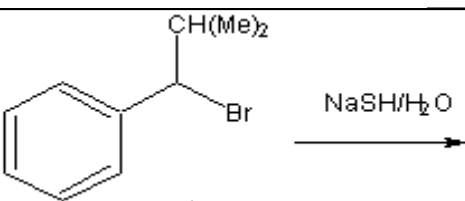
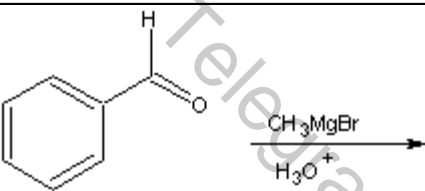
Column I	Column II
(A) Ethanal	(p) $[\text{Ag}(\text{NH}_3)_2]\text{OH}$
(B) Glucose	(q) CuO
(C) Glyoxal	(r) 
(D) Benzaldehyde	(s) I_2/NaOH

21. Match each of the compounds given in column-I with the reaction that they can undergo given in column -II

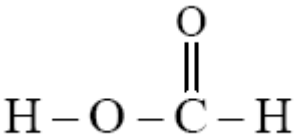
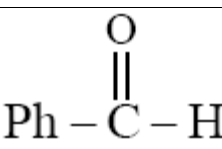
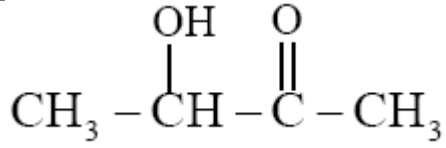
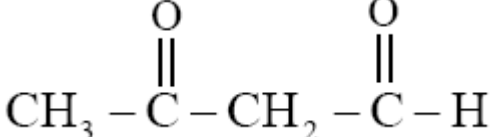
A		P	Nucleophilic substitution
B		Q	Elimination
C		R	Nucleophilic addition
D		S	esterification with acetic anhydride
		T	dehydrogenation

22. Match the Following:

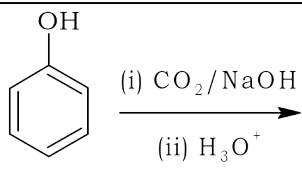
Column I	Column II
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
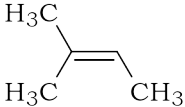
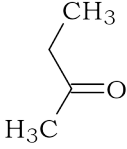
(a)		(p)	Racemic mixture
(b)		(q)	Addition reaction
(c)		(r)	Substitution reaction
(d)		(s)	Carbocation intermediate

23. Match the Following:

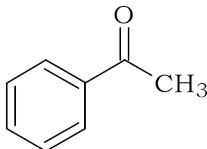
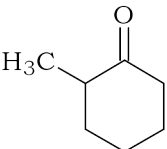
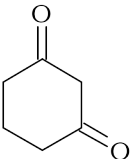
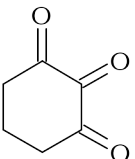
COLUMN - I		COLUMN - II	
(A)		(P)	(+ ve) Tollen's Test
(B)		(Q)	Cannizaro Reaction
(C)		(R)	(+ ve) Haloform Test
(D)		(S)	Aldol condensation

24. Match the following:

Column I		Column II	
(A)		(p)	Involves a carbocation intermediate

(B)	 $\xrightarrow{\text{Con. H}_2\text{SO}_4}$	(q)	The electrophile involved is not electron deficient.
(C)	 $\xrightarrow{\text{HBr}}$	(r)	Gives a pair of enantiomers.
(D)	 $\xrightarrow[\text{NaCN}]{\text{HCN}}$	(s)	The product has more number of pi bonds than the reactant.
		(t)	Heating the product with aqueous NaOH results in the formation of a salt.

25. Match the compounds in Column – I with their characteristics in Column – II.

Column I		Column II	
(A)		(p)	Forms a stable hydrate.
(B)		(q)	Gives yellow precipitate with NaOI.
(C)		(r)	Reacts with only one equivalent of $\text{NH}_2\text{OH} \cdot \text{HCl}$ and gives two isomeric oximes.
(D)		(s)	Undergoes addition as well as substitution reactions.
		(t)	Has a double bond equivalent more than 3.

26. Match the following

	Column-I (Reactions)		Column-II (Involved phenomenon)
a)	$2\text{CH}_3\text{CH}=\text{O} \xrightarrow{\text{OH}^-} \text{CH}_3-\text{CH}=\text{CH}-\text{CH}=\text{O}$	p)	Oxidation
b)	$2\text{HCHO} \xrightarrow{\text{OH}^-} \text{CH}_3\text{OH} + \text{HCOO}^-$	q)	Condensation
c)	$\text{phCH}=\text{O} \xrightarrow{\text{HCN}} \text{ph}-\overset{\text{OH}}{\underset{ }{\text{CH}}}-\text{C}\equiv\text{N}$	r)	Nucleophilic addition
d)	$\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3 \xrightarrow{\text{I}_2, \text{OH}^-} \text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}^- + \text{CHI}_3$	s)	Electrophilic substitution
		t)	Nucleophilic substitution

27. Match the following column I and II

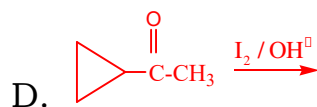
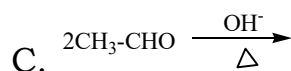
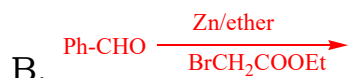
Column - I		Column - II	
(A)		(p)	Yellow precipitate with $I_2 / NaOH$
(B)		(q)	Isomer of $C_6H_5 \cdot \overset{\overset{O}{\parallel}}{C} - OC_3H_7$
(C)		(r)	Stronger acid than benzoic acid.
(D)		(s)	Yellow orange precipitate with 2,4 - dinitrophenyl hydrazine.

28. Match Column -I with Column - II.

Column -I	Column -I
A)	p Haloform
B) $H - \overset{\overset{O}{\parallel}}{C} - H$	q CericAmmonium nitrate
C) $CH_3 - \overset{\overset{O}{\parallel}}{C} - H$	r) Cannizaro's reaction
D) $CH_3 - \overset{\overset{O}{\parallel}}{C} - CH_3$	s Aldol condensation

29.

Column-I	Column-II
A. $Ph-CHO \xrightarrow[\Delta]{AC_2O/ACONa}$	P. Reformatsky reaction



Q. Aldol reaction

R. Perkins reaction

S. Haloform reaction

30. Match the following :

Column - I

(A) $\text{CH}_3\text{CH}_2\text{OH}$

(B) CH_3CHO

(C) $\text{C}_6\text{H}_5\text{-CHO}$

(D) $\text{CH}_3\text{-CO-CH}_3$

Column - II

(p) Aldol Condensation

(q) Cannizzaro reaction

(r) Keto-enol tautomerism

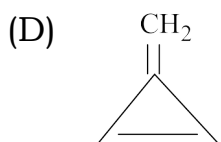
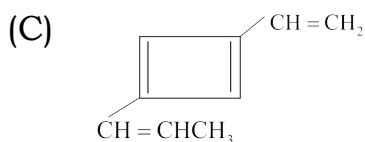
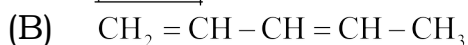
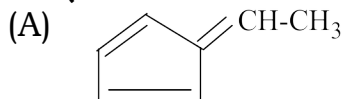
(s) Iodoform reaction

(t) Perkin reaction

31. Match the following type :

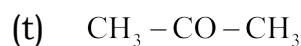
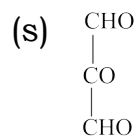
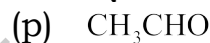
Column I

(Reductive Ozonolysis)



Column II

(Possible products)



32. Match the Following:

Column I		Column II	
(a)	$\text{C}_6\text{H}_5\text{-CN} \xrightarrow[\text{HCl}]{\text{SnCl}_2}$	(p)	$\text{C}_6\text{H}_5\text{-CH} = \text{NH.HCl}$
(b)	$\text{H-C} \begin{array}{l} \text{O}-\text{C}_2\text{H}_5 \\ \text{O}-\text{C}_2\text{H}_5 \\ \text{O}-\text{C}_2\text{H}_5 \end{array} \xrightarrow[\text{H}_3\text{O}^+]{\text{C}_6\text{H}_5\text{MgCl}}$	(q)	$\text{C}_6\text{H}_5\text{-CH(OC}_2\text{H}_5)_2$

(c)	$C_6H_5 - \overset{\overset{O}{\parallel}}{C} - CH_3 \xrightarrow{\text{Peracid}}$	(r)	$CH_3 - \overset{\overset{O}{\parallel}}{C} - O - C_6H_5$
(d)	$C_6H_5 - OH + CH_3COCl \xrightarrow{NaOH}$	(s)	$C_6H_5 - CHO$
		(t)	$CH_3 - O - \overset{\overset{O}{\parallel}}{C} - C_6H_5$

33. Match the Following:

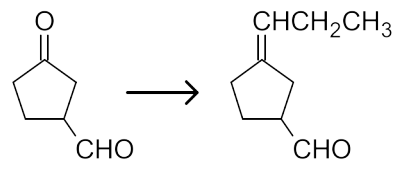
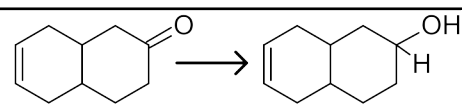
Column I (Compound)		Column II (Reaction / test shown by the compound)	
(a)		(p)	Tollen's Test
(b)	$(CHO)_2$	(q)	Fehling's Test
(c)		(r)	Intramolecular Cannizzaro's reaction
(d)		(s)	Intramolecular aldol condensation
		(t)	Haloform Test

34. Match the following

	Column-I (Reactions)	Column-II (Involved phenomenon)
a)	$2CH_3CH=O \xrightarrow{OH^-} CH_3 - CH = CH - CH = O$	p) Oxidation

35. Match the Following.

b)	Column-I (Mixture) $2CH_3CHO \xrightarrow{OH^-, \Delta} CH_3CH(OH)CH_2CHO + HCOO^-$	Column-II (pH) Condensation
c)	$phCH=O \xrightarrow{HCN} ph-CH(OH)-C \equiv N$	(under adiabatic free expansion) Nucleophilic addition
(a) d)		(p) CH_2OH s) Electrophilic substitution
		(i) CHI_3 t) Nucleophilic substitution
(b)		(q) $NaBH_4$

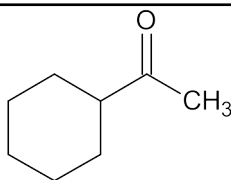
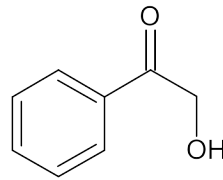
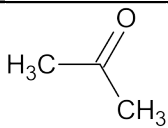
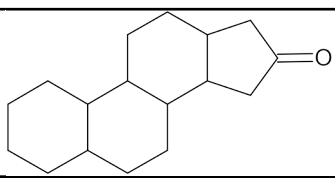
(c)		(r)	$\begin{array}{c} CH_2 - OH \\ \\ CH_2 - OH \end{array}$
(d)		(s)	$\begin{array}{c} CH_2 - OH \\ \\ CH_2 - OH \end{array}$ ii) $NaBH_4$, iii) H_3O^+

36.

Match the Following:

Column I		Column II	
(a)	Reimer-Tiemann reaction	(p)	Carbocation
(b)	Fries' rearrangement	(q)	Carbanion
(c)	Friedel-Craft's reaction	(r)	Carbene
(d)	Aldol condensation	(s)	Acylium ion

37. Match the Following:

Column I		Column II	
(a)		(p)	Gives reddish brown precipitate with $CuSO_4$ /sodium potassium tartrate solution
(b)		(q)	Shows tautomerism
(c)		(r)	Gives two isomeric compounds with hydrazine hydrochloride
(d)		(s)	Gives yellow precipitate with $I_2/NaOH$

Matching Answers

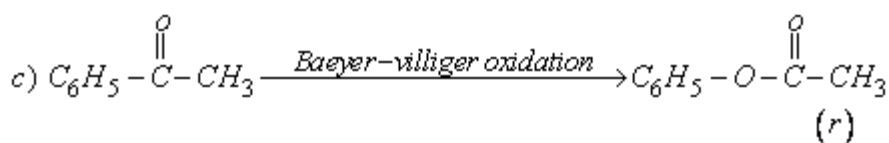
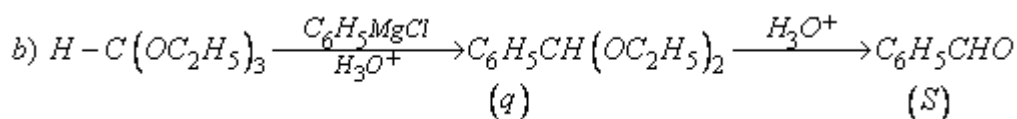
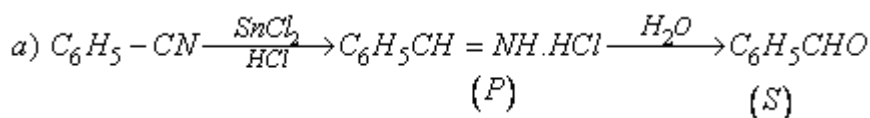
1	A - R B - S	2	A - QRS B - PQR	3	A - PQST B - PR	4	A - PS B - QS	5	A - R B - R	6	A - R B - P
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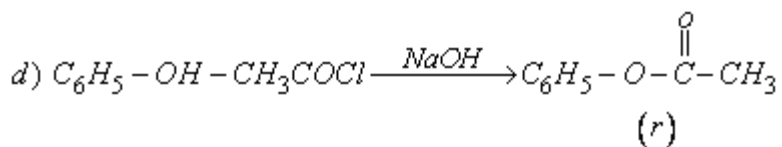
	C – P D – Q		C – QS D – QR		C – P D – PQ		C – R D – R		C – PS D – PS		C – S D – Q
7	A – PQS B – PRS C – PQS D – PQS	8	A – R B – P C – Q D – S	9	A – R B – S C – P D – Q	10	A-PRS B-S C-PRS D-PQS	11	A-PQS B-PQRS C-P D-QRS	12	A-PQS B-P C-PQS D-PQS
13	A-PQS B-RS C-Q D-RS	14	A – PQS B – RS C – P D – QRS	15	A-R B-S C-Q D-P	16	A-PQS B-P C-PQS D-PQS	17	A-Q B-P C-Q D-R	18	A-S B-Q C-P D-Q
19	A-P B-S C-R D-Q	20	A-PQRS B-PQ C-P D-PR	21	A-PQT B-PQST C-P D-RS	22	A-PQ B-R C-PRS D-PQ	23	A – P B – PQ C – PRS D – PRS	24	A-QST B-PQST C-PT D-RST
25	A-QRST B-S C-QS D-PST	26	A-QR B-PRT C-QR D-PST	27	A-QR B-QS C-PQS D-PRS	28	A-R B-R C-PS D-PS	29	A-R B-P C-Q D-S	30	A-S B-PRS C-QT D-PRS
31	A-PQS B-PQR C-PRS D-RS	32	A-PS B-QS C-R D-R	33	A-PQST B-PR C-P D-PQ	34	A-QR B-PRT C-QR D-PST	35	A-R B-S C-P D-Q	36	A-R B-S C-P D-Q
37	A-QRS B-PQR C-QS D-QR										

ALDEHYDES & KETONES – SOLUTIONS

Matching solutions

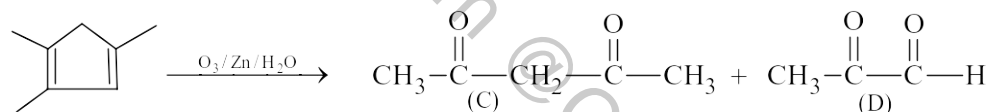
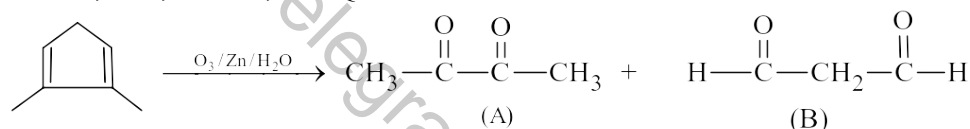
1. Conceptual
2. Conceptual
3. Conceptual
- 4.





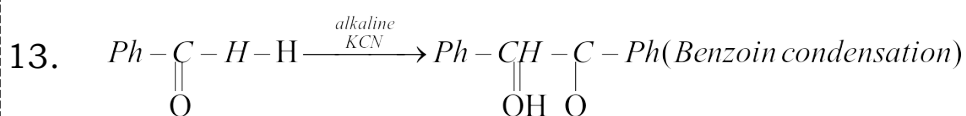
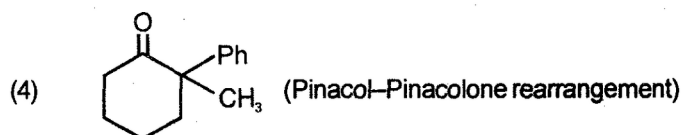
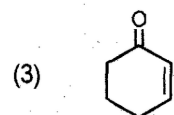
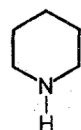
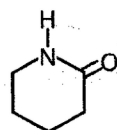
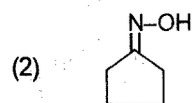
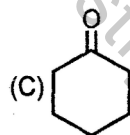
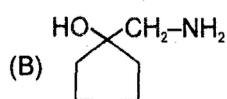
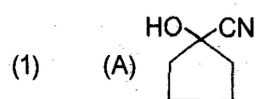
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6. Conceptual
7. Conceptual
8. Based on Name reactions
9. Conceptual

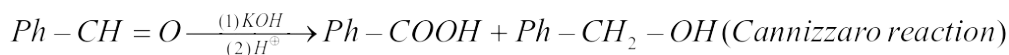
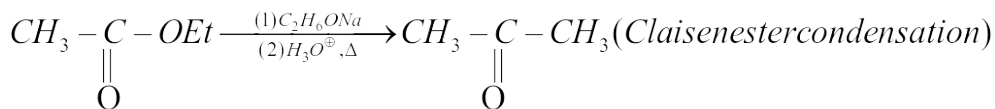
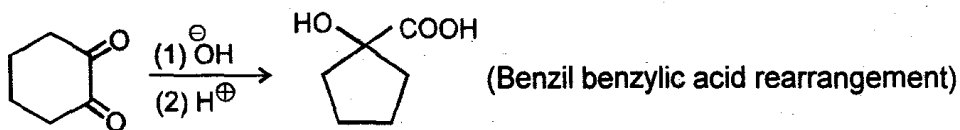
10. A-PRS, B-S, C-PRS, D-PQS



11. A-PQS; B-PQRS; C-P; D-QRS

12.





14. Conceptual

15. Conceptual

16. Conceptual

17. Conceptual

18. Conceptual

19. Conceptual

20. Conceptual

21. Conceptual

22. Conceptual

23. Conceptual

24. Conceptual

25. Conceptual

26. $a \rightarrow q, r; b \rightarrow p, r, t; c \rightarrow q, r; d \rightarrow p, s, t$

27. $A \rightarrow q, r, B \rightarrow q, s, C \rightarrow p, q, s, D \rightarrow p, r, s$

(A) Stronger acid than benzoic acid due to Ortho effect

(B) Give positive test with 2,4-DNP, due to presence of CHO group.

(C) Give yellow precipitate with I_2/NaOH and yellow orange precipitate with

2,4-DNP, due to presence of $\begin{array}{c} \text{O} \\ \parallel \\ -\text{C}-\text{CH}_3 \end{array}$ group

(D) Stronger acid than benzoic acid, due to $-\text{I}$, $-\text{R}$ or COCH_2I and give yellow precipitate with I_2/NaOH and yellow orange precipitate with 2,4-DNP, due to presence of COCH_2I group

28. a) r

b) r

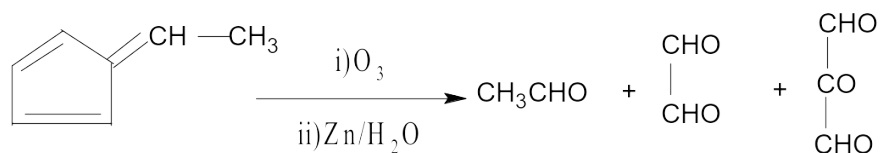
c) p, s

d) p, s

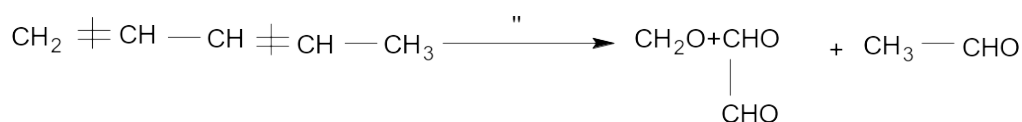
29. Conceptual

30. Conceptual

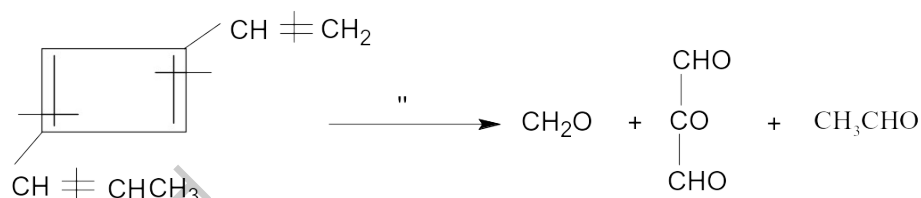
31. (A)



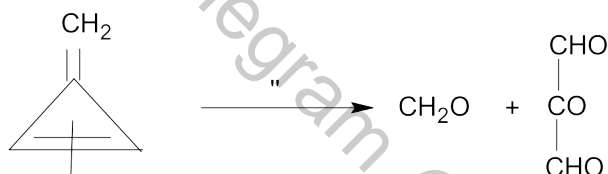
(B)



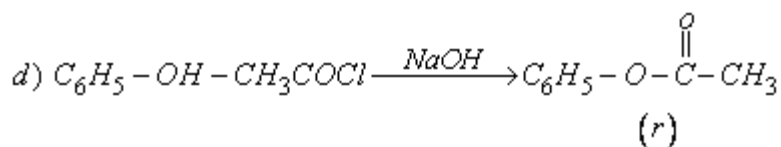
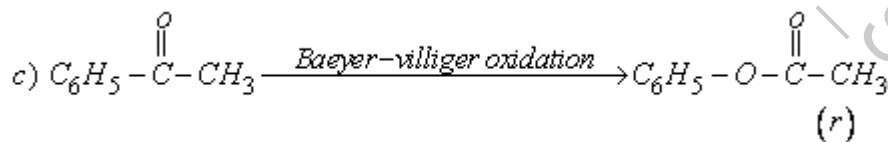
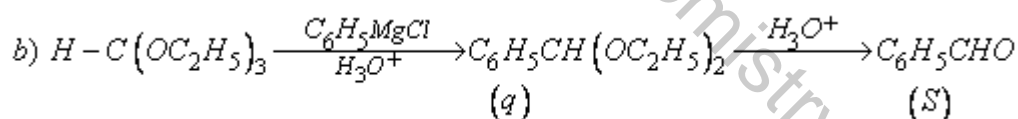
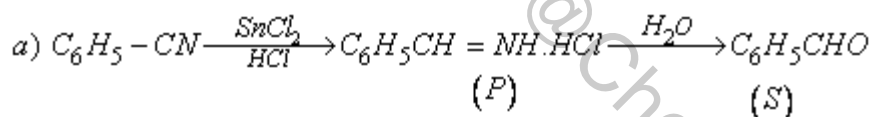
(C)



(D)



32.



33. Conceptual

34. $a \rightarrow q, r; b \rightarrow p, r, t; c \rightarrow q, r; d \rightarrow p, s, t$

35. Conceptual

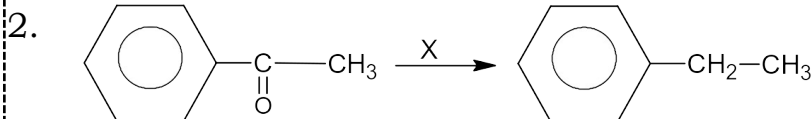
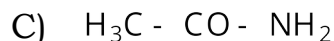
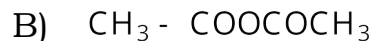
36. Explanation : (A) \rightarrow (R) ; (B) \rightarrow (S) ; (C) \rightarrow (P) ; (D) \rightarrow (P) and (Q) ;

37. Conceptual

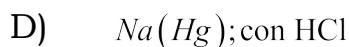
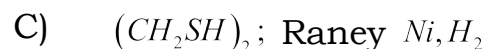
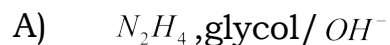
ALDEHYDES & KETONES

One or more than one answer type questions:

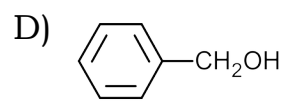
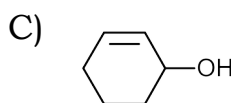
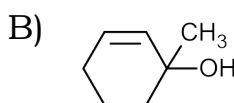
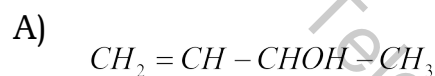
1. Which of the following will give yellow precipitate with $I_2 / NaOH$?



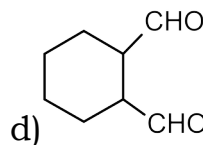
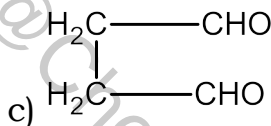
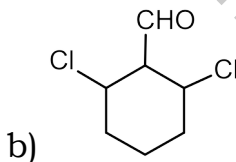
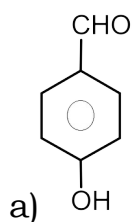
In this conversion reagent (X) could be



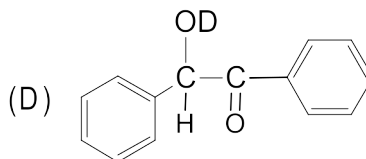
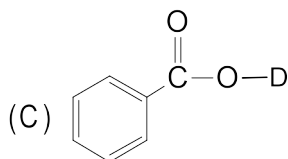
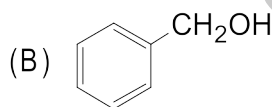
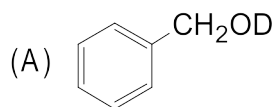
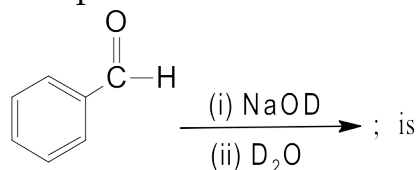
3. Which of the following are converted to aldehydes or ketones by MnO_2 ?



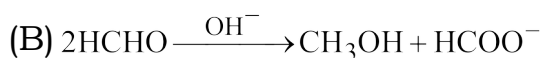
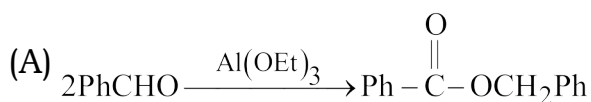
4. Which of the following compounds do not give Cannizzaro reaction ?

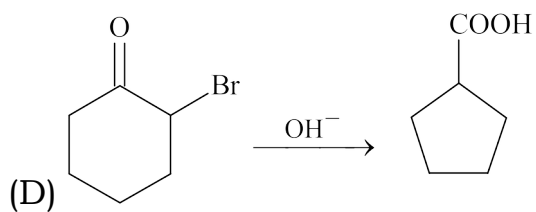
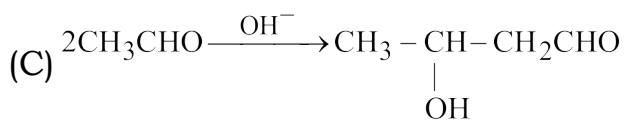


5. The products of the following reaction are,

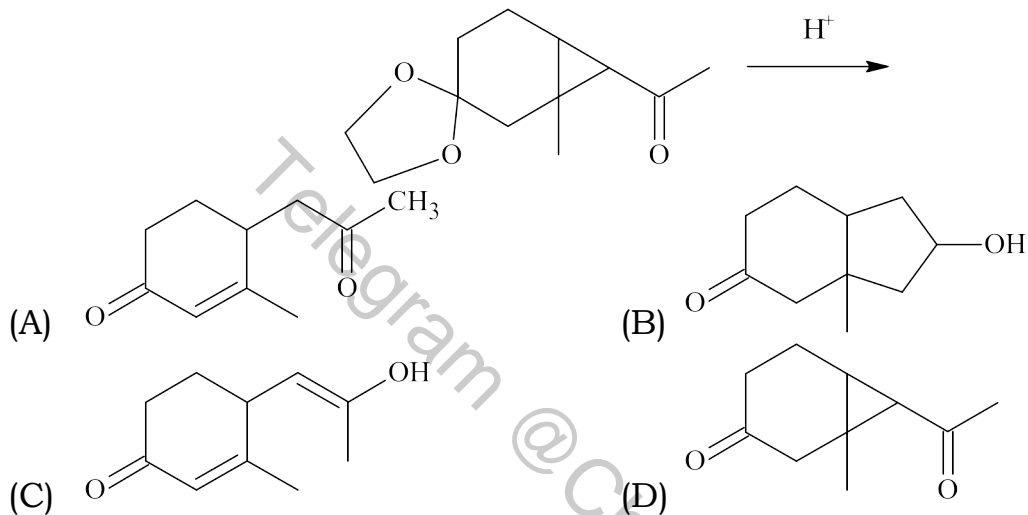


6. Which of the following are disproportionation reactions?

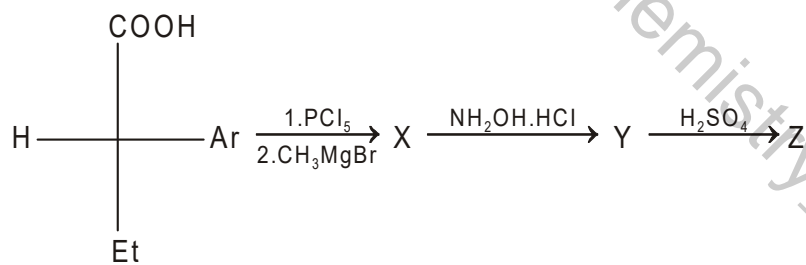




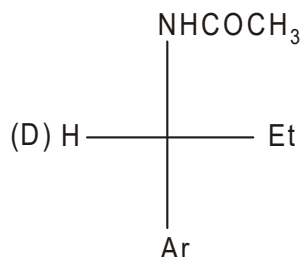
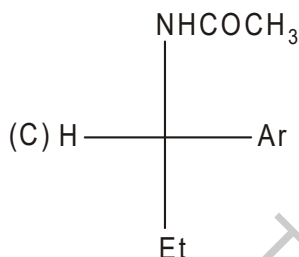
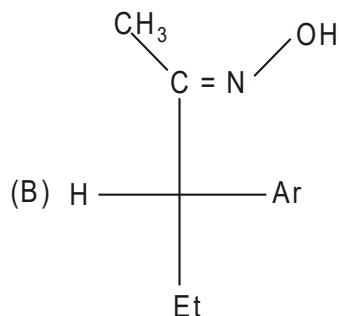
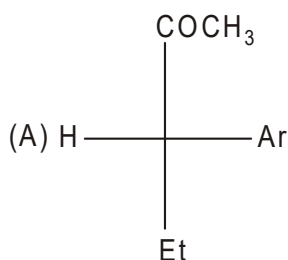
7. Identify the possible products formed during the following reaction



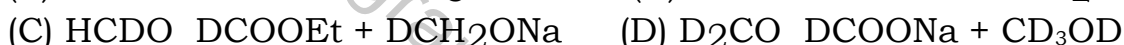
8.



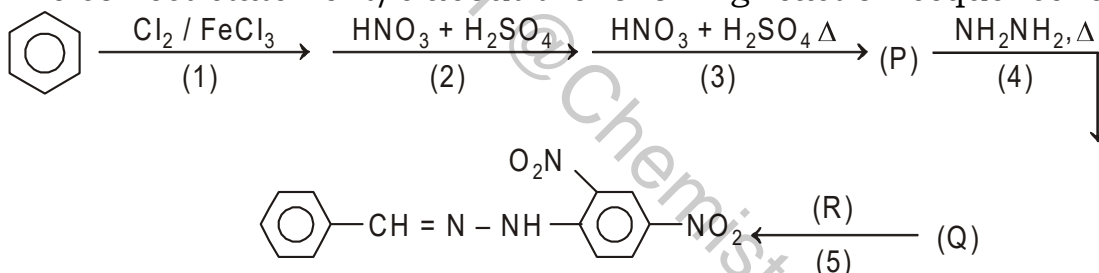
X, Y, Z are -



9. Which of the following products is/are correctly mentioned in the following reactions.



10. The correct statement/s about the following reaction sequence is / are

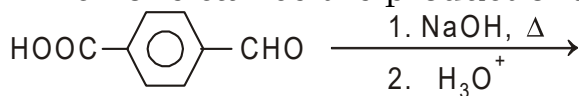


- (A) 'R' gives an aldol condensation reaction on heating with NaOH solution
 (B) The rate of deuteration in presence of heavy water the rate of acid catalysed halogenation are same
 (C) Base catalysed haloform reaction involves formation of carbanion
 (D) Acid catalysed halogenation of CH_3COCH_3 involves enol formation

11. Which statement is / are correct ?

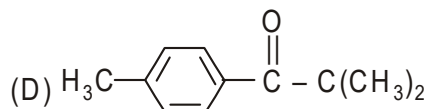
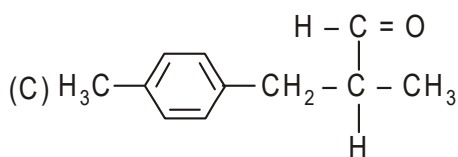
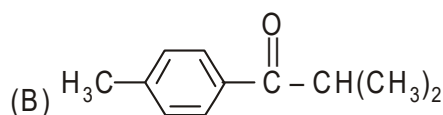
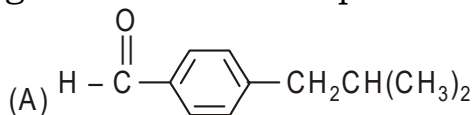
- (A) The rates of acid catalysed chlorination, bromination of acetone are same
 (B) The rate of deuteration in presence of heavy water the rate of acid catalysed halogenation are same
 (C) Base catalysed haloform reaction involves formation of carbanion
 (D) Acid catalysed halogenation of CH_3COCH_3 involves enol formation

12. Which one can be the product of the following reaction ?

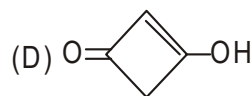
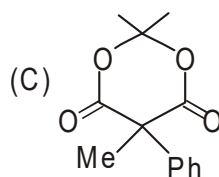
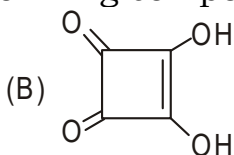
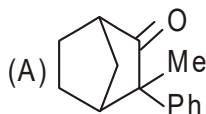


- (A) A diacid (B) A monoacid (C) A diol (D) An alcohol

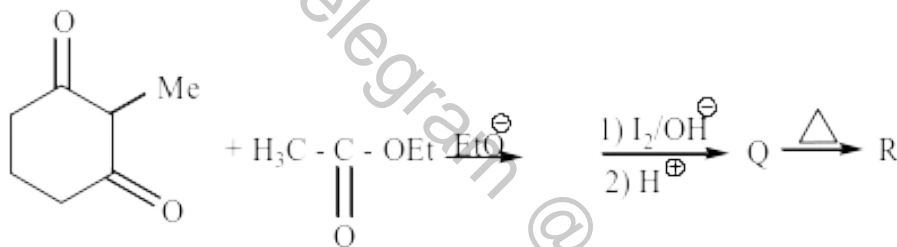
13. Which of these carbonyl compounds on reduction with $\text{Zn} - \text{Hg} / \text{HCl}$ will give the same compound as product



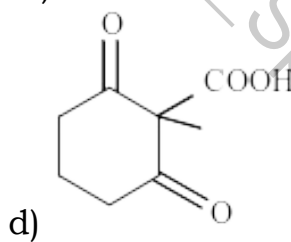
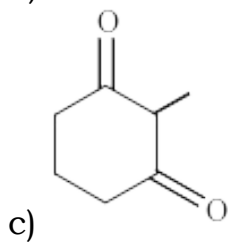
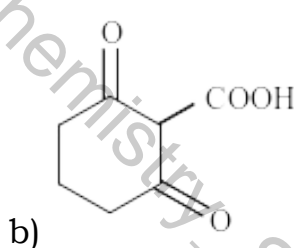
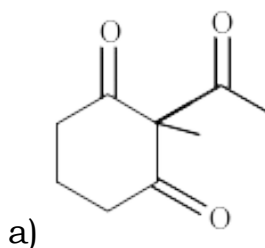
14. Which one of the following compounds will not show enolisation?



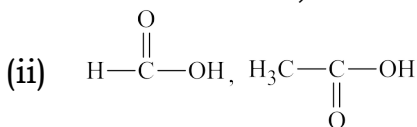
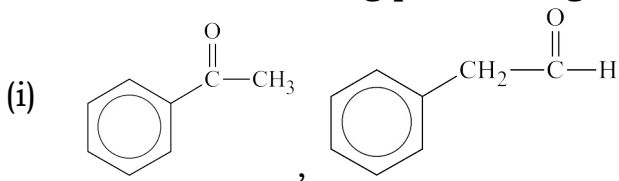
15.

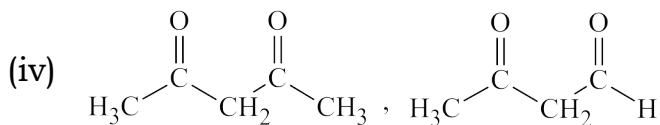
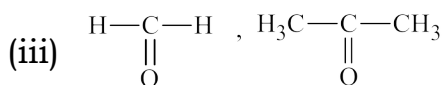


The products of the above reaction is/are



16. Consider the following pairs of organic compounds

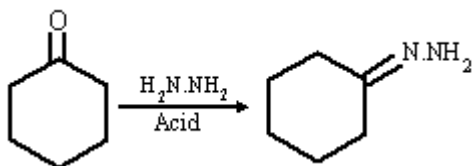




Test/s that can make distinction between each and every pair is / are

- (A) Victor-Meyer's test (B) Tollen's test
 (C) Iodoform test (D) Mulliken's test.

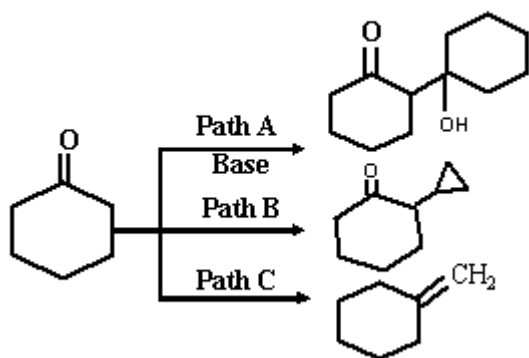
17.



The correct statements regarding this reaction

- (A) The first step is r.d.s when the P^{H} of the reactions is < 4.5
 (B) The second step is r.d.s when the P^{H} of the reaction mixture is approximately 7
 (C) The reaction proceeds with optimum speed and yield is also good when the P^{H} of the reaction mixture is 4.5 approximately.
 (D) The rate of the reaction is very low at $\text{P}^{\text{H}} = 1$

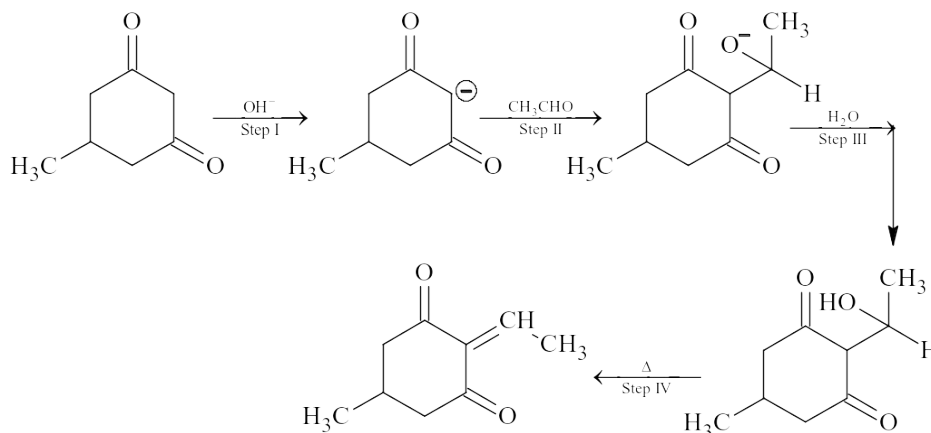
18.



Correct statement regarding this reaction chart

- (A) Path 'A' involves the formation of an enolate ion
 (B) Path 'B' is alkylation
 (C) Path 'C' involves the formation of Betaine if CH_3Cl , $(\text{Ph})_3\text{P}$ and Bu-Li are used
 (D) Path 'C' can also be achieved by Wolf kishner reduction

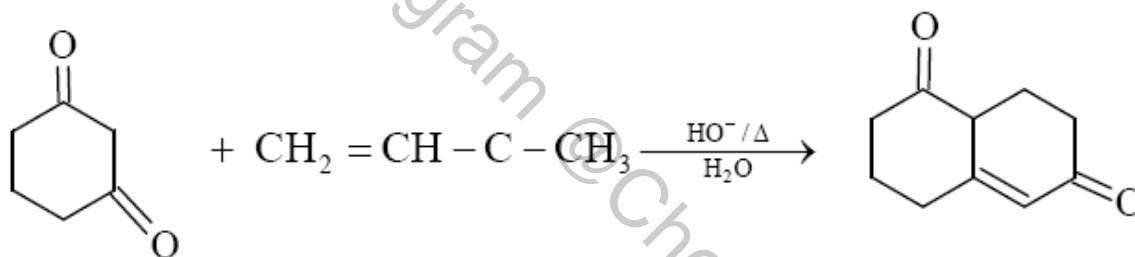
19. Consider the following sequence



Which of following statements are correct for above reaction sequence?

- (a) Step I is acid-base reaction
- (b) Step II is nucleophilic addition reaction
- (c) Step III is acid base reaction
- (d) Step IV is elimination reaction

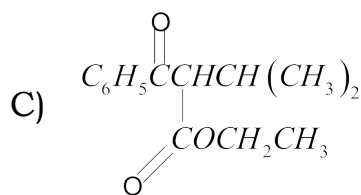
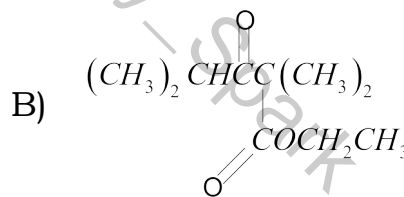
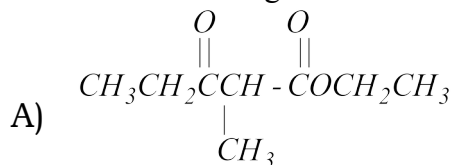
20.



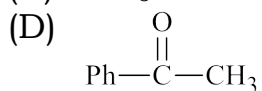
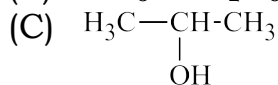
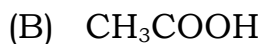
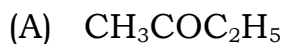
Select the reactions and mechanism evolved.

- (A) Michael Addition
- (B) E-1 CB
- (C) Aldol addition reaction
- (D) Acid-base reaction

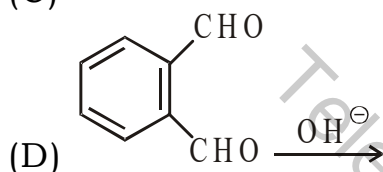
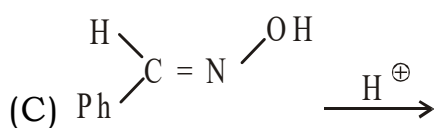
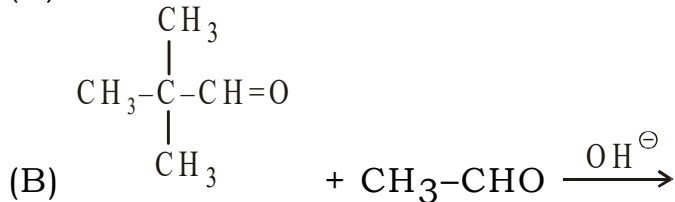
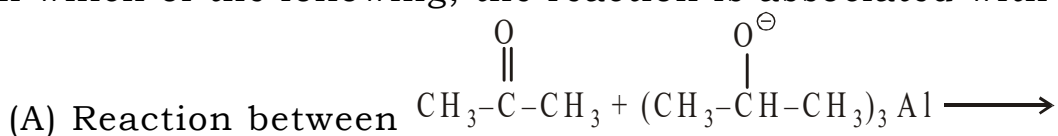
21. Which of the following keto esters is/are not likely to have been prepared by a Claisen condensation?



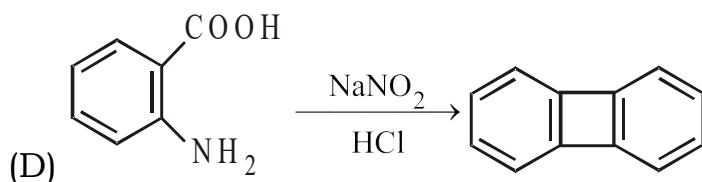
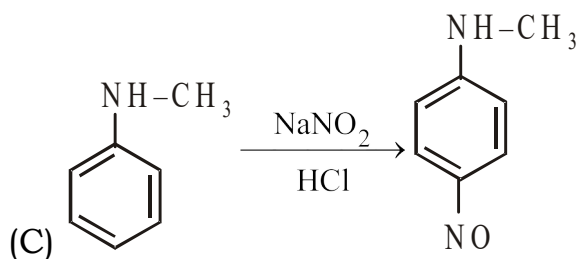
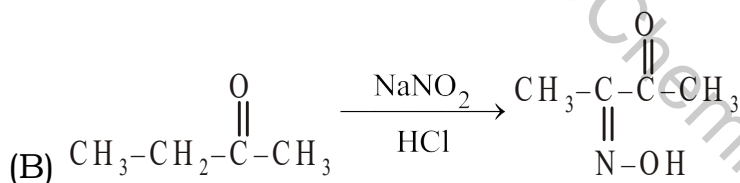
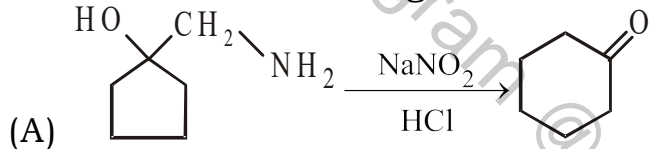
22. Which of the following responds to iodoform test with NaOH/I₂ ?



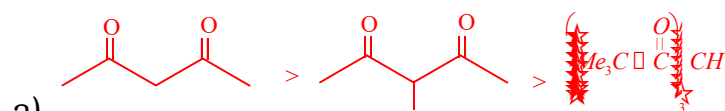
23. In which of the following, the reaction is associated with hydride shift



24. Which of the following reactions are correct ?

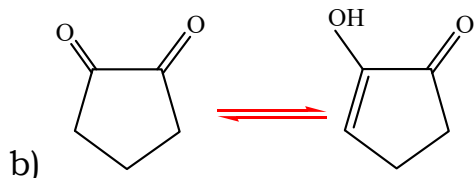


25. Which of the following statement are correct

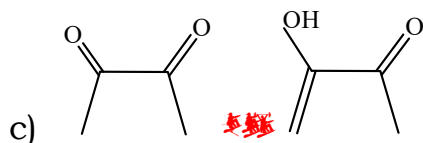


respective molecules

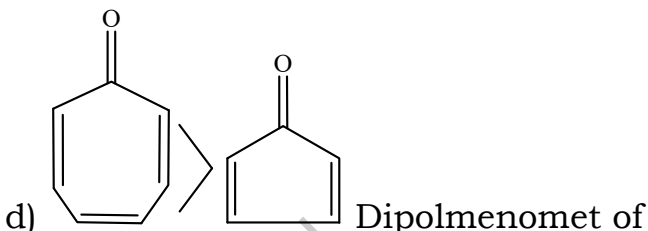
decreasing order of enol content of



enol % is more than keto form at equilibrium



enol % is more than keto form at equilibrium

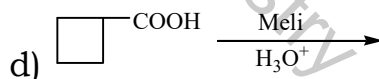
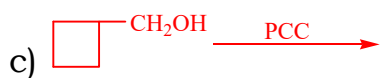
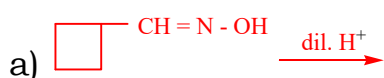


Dipolmenomet of

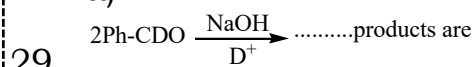
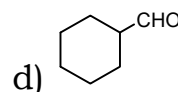
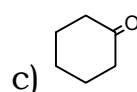
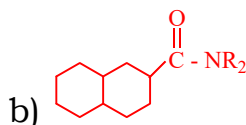
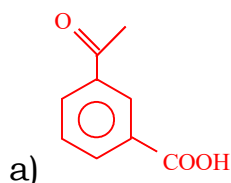


- Step - I is nucleophilic addition
- Step-I is nucleophilic substitution,
- Step-II is elimination by E_1 Mechanism
- Step - II is elimination by $\text{E}_{1\text{CB}}$ Mechanism

27. Which of the following reactions form cyclo-butane carbaldehyde.

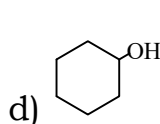
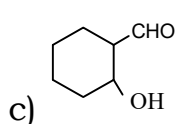
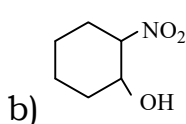
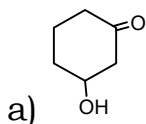


28. Which of the following compounds not reduce to alkane in Clemmenson's reduction.



- Ph-COOD
- Ph-CH₂OH
- Ph-CD₂OH
- Ph-COOH

30. The compounds readily undergoes $\text{E}_{1\text{cb}}$ mechanism in base medium.



31. An alkene having M.F ($\text{C}_{16}\text{H}_{16}$) $\xrightarrow[\text{Ozonolysis}]{\text{Reductive}}$ (A) $\xrightarrow{\text{NaOCl}}$ (B) + CHCl_3 . The alkene shows geometrical isomerism. Which of the following statements are correct for

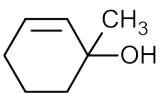
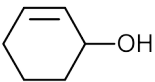
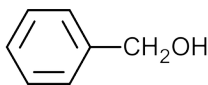
the above reaction?

- A) B is a salt of carboxylic acid
- B) B on decarboxylation gives an aromatic compound
- C) A is a carbonyl compound
- D) A on reduction gives 2° alcohol

32. Which of the following will give yellow precipitate with $I_2 / NaOH$?

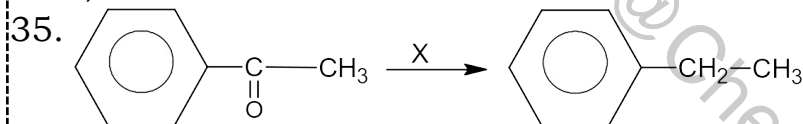
- A) $I - CH_2 - CO - CH_2 - CH_3$
- B) $CH_3 - COOCOCH_3$
- C) $H_3C - CO - NH_2$
- D) $CH_3 - CH(OH)CH_2CH_3$

33. Which of the following are converted to aldehydes or ketones by MnO_2 ?

- A) $CH_2 = CH - CHOH - CH_3$
- B) 
- C) 
- D) 

34. $(CH_2OH)_4C$ is prepared from formaldehyde and acetaldehyde. The reaction involves,

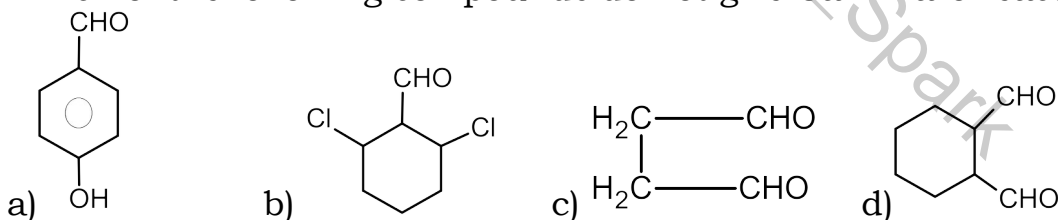
- A) Cannizzaro reaction
- B) Tollen's reaction
- C) Aldol condensation
- D) Schmidt reaction



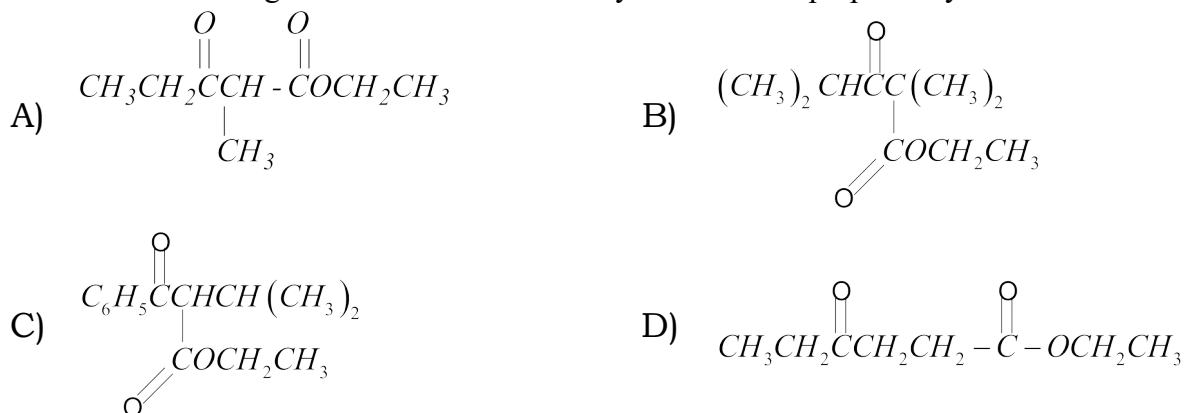
In this conversion reagent (X) could be

- A) N_2H_4 , glycol / OH^-
- B) Red P / HI
- C) $(CH_3SH)_2$; Raney Ni, H_2
- D) $Na(Hg)$; con HCl

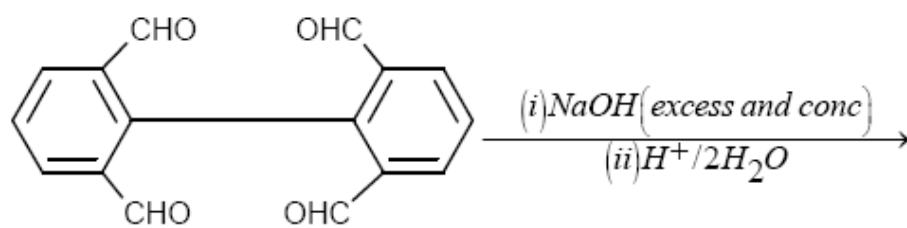
36. Which of the following compounds do not give Cannizzaro reaction ?



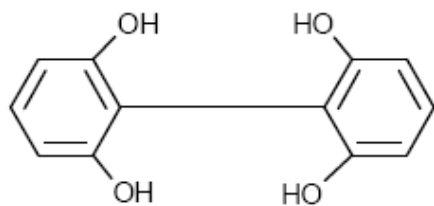
37. Which of the following keto esters is/are not likely to have been prepared by a Claisen condensation?



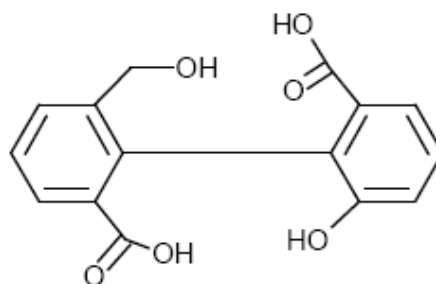
38.



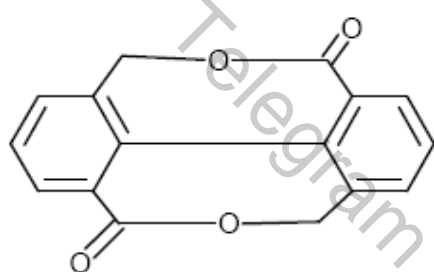
A)



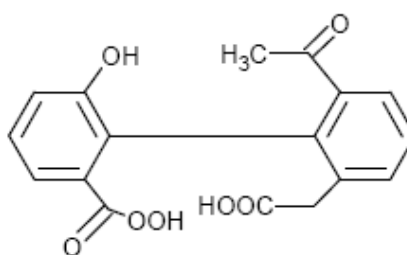
B)



C)



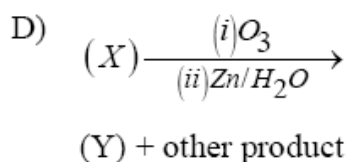
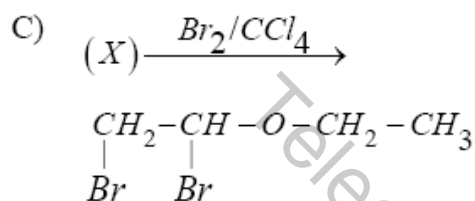
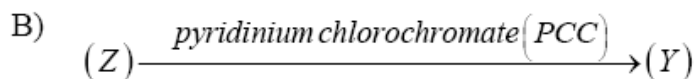
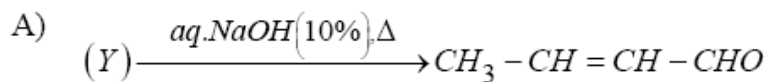
D)



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39.

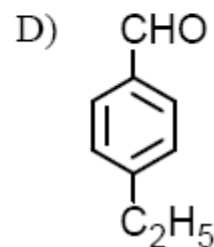
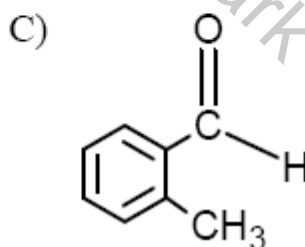
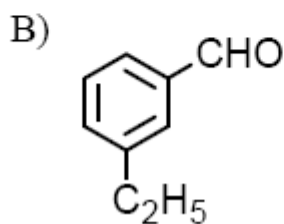
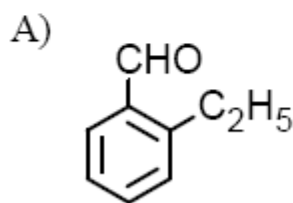
Compound (X) C_4H_8O decolourises Baeyers reagent. It undergoes hydrolysis on reaction with dii. H_2SO_4 and produces (Y) and (Z). Both (Y) and (Z) give Iodoform test. Only (Y) gives Tollens test. Choose the correct statement



40.

An aromatic compound X with molecular formula, $C_9H_{10}O$ gives the following chemical tests.

- Forms 2,4-DNP derivative
- Reduces Tollen's reagent.
- Undergoes Cannizaro reaction
- On vigorous oxidation 1,2-benzene dicarboxylic acid is obtained. X is.



41. In the process $CH_3CHO \xrightarrow{OH^-} CH_3CH(OH)CH_2CHO$, which of the following possible intermediate species are obtained ?



ALDEHYDES & KETONES – KEY SHEET

One or more than one Answers

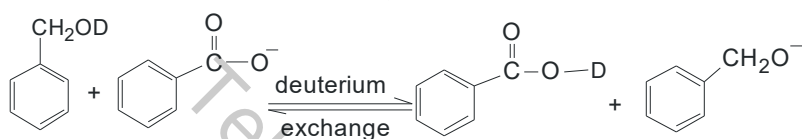
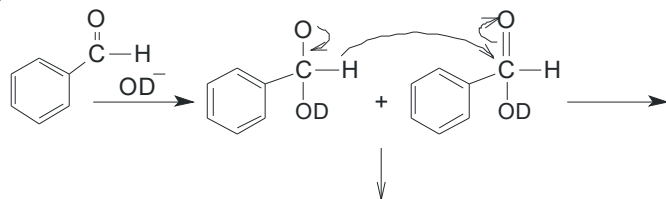
1	AD	2	ABCD	3	ACD	4	ABC	5	AC	6	AB
7	ACD	8	ABC	9	ABCD	10	BC	11	ABCD	12	ABD
13	ABC	14	ABCD	15	ACD	16	B	17	ABCD	18	ABC
19	ABCD	20	ABCD	21	BD	22	ACD	23	ABD	24	ABD
25	ABD	26	AD	27	ABC	28	AB	29	AC	30	ABC
31	ABCD	32	AD	33	ACD	34	AC	35	ABCD	36	ABC
37	BD	38	B	39	ABC	40	AC	41	ABCD		

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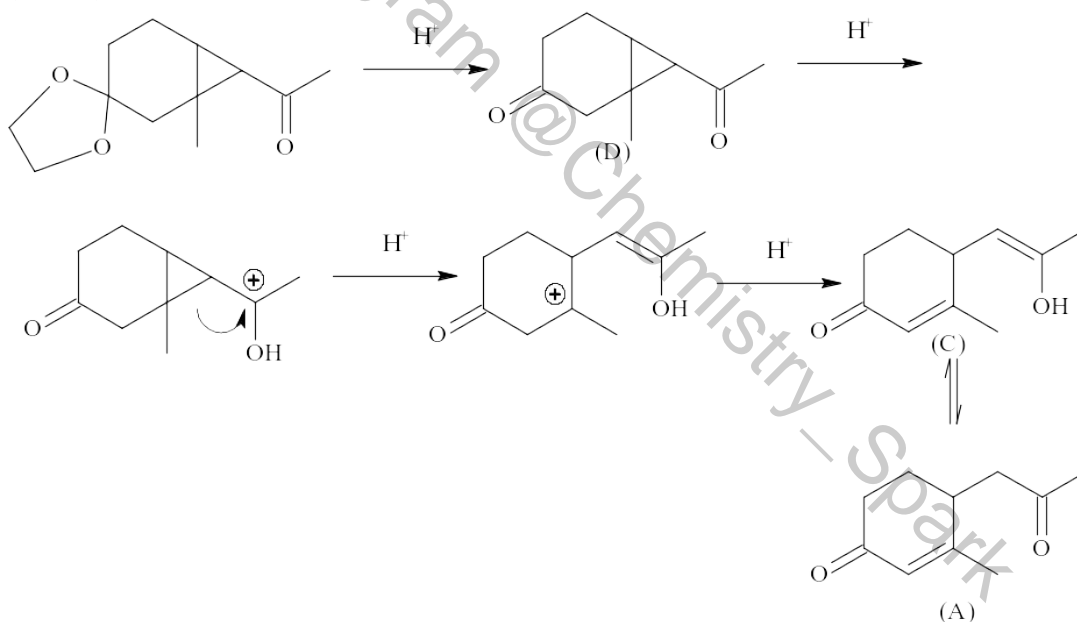
ALDEHYDES & KETONES – SOLUTIONS

One or more than one solutions

1. Conceptual
2. Fact
3. ACD
4. ABC
5. (AC)

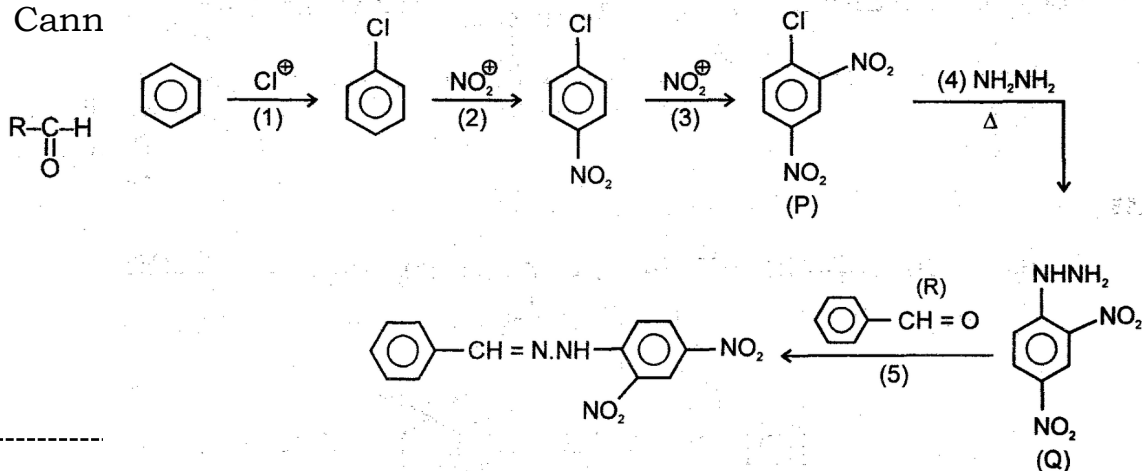


6. AB
7. (ACD)



8. (A, B, C) Bakemann's rearrangement.
9. (A, B, C, D)

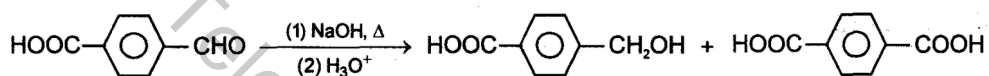
Cann



10. (B, C)

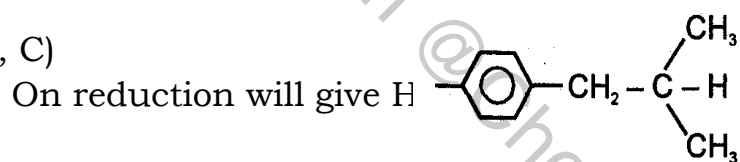
11. (A, B, C, D)

12. (A, B, D)



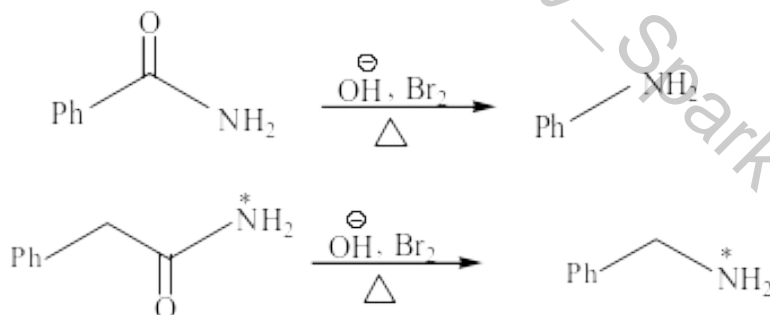
It is a Cannizzaro reaction.

13. (A, B, C)



14. (A, B, C, D)

15. Hoffmann rearrangement is an intramolecular reaction hence, no cross over products formation takes place.



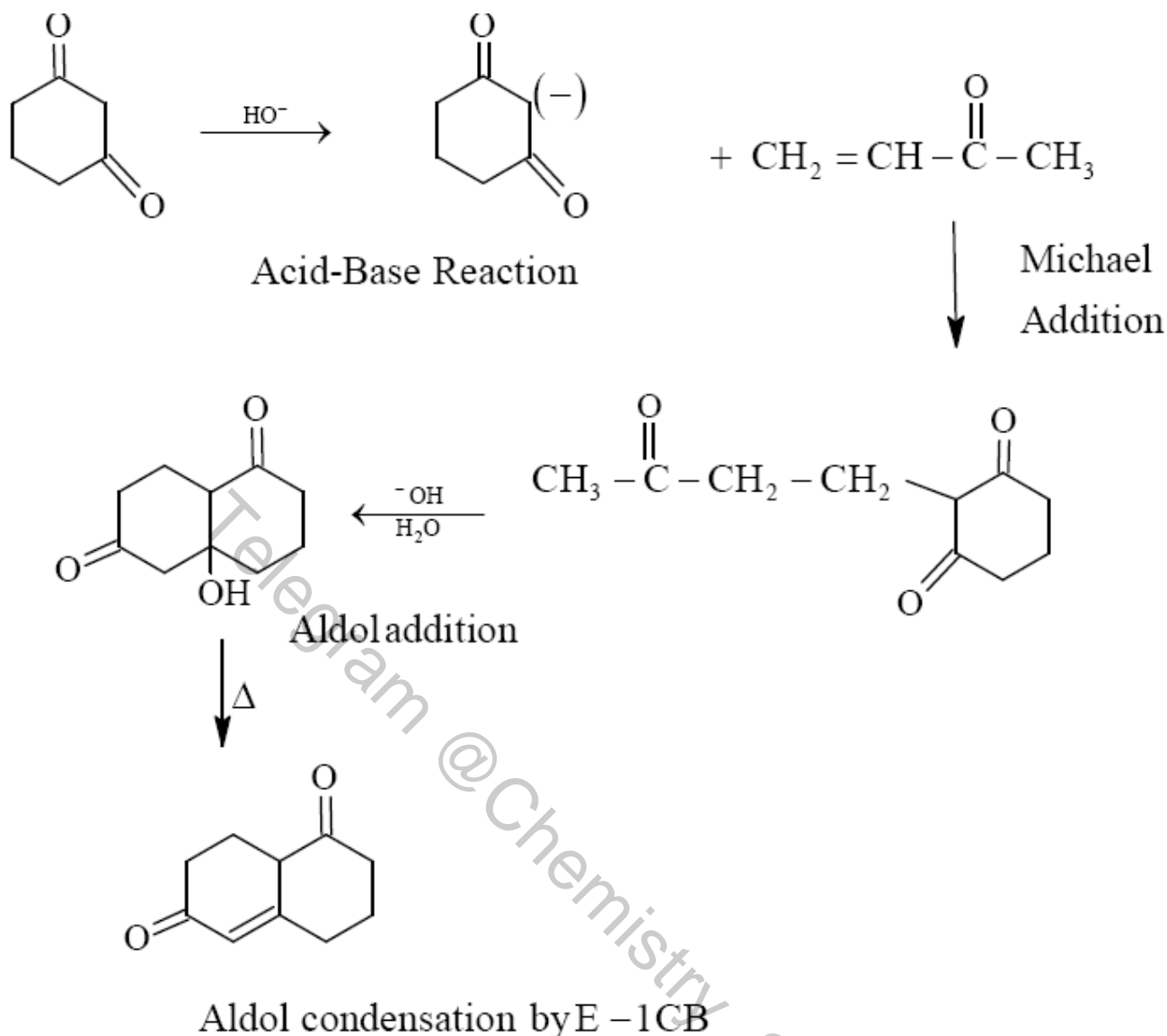
16. Conceptual

17. Conceptual

18. Conceptual

19. ABCD

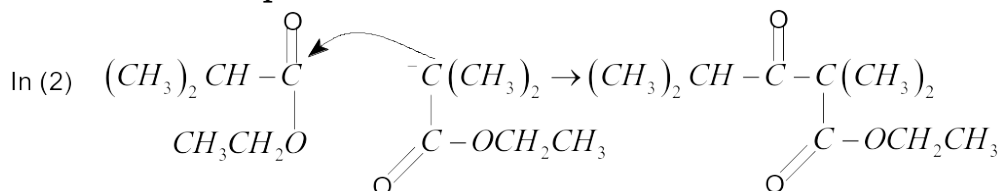
20.



21.

Ans: B,D

α -H deprotonation is essential in the Claisen condensation, otherwise reaction is not possible.

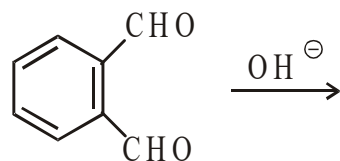
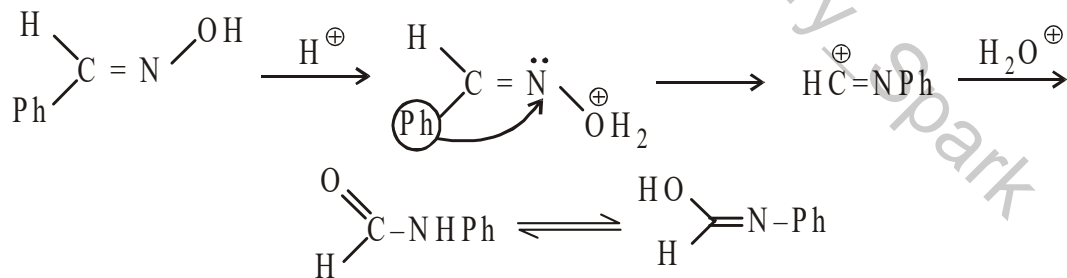
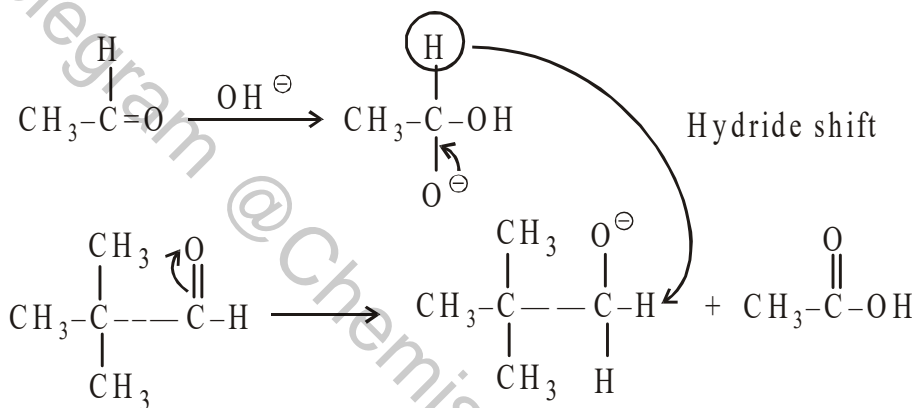
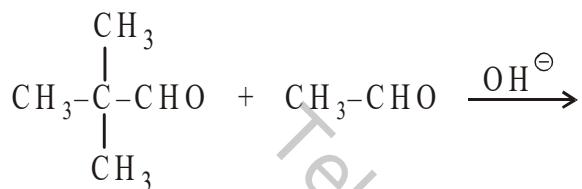
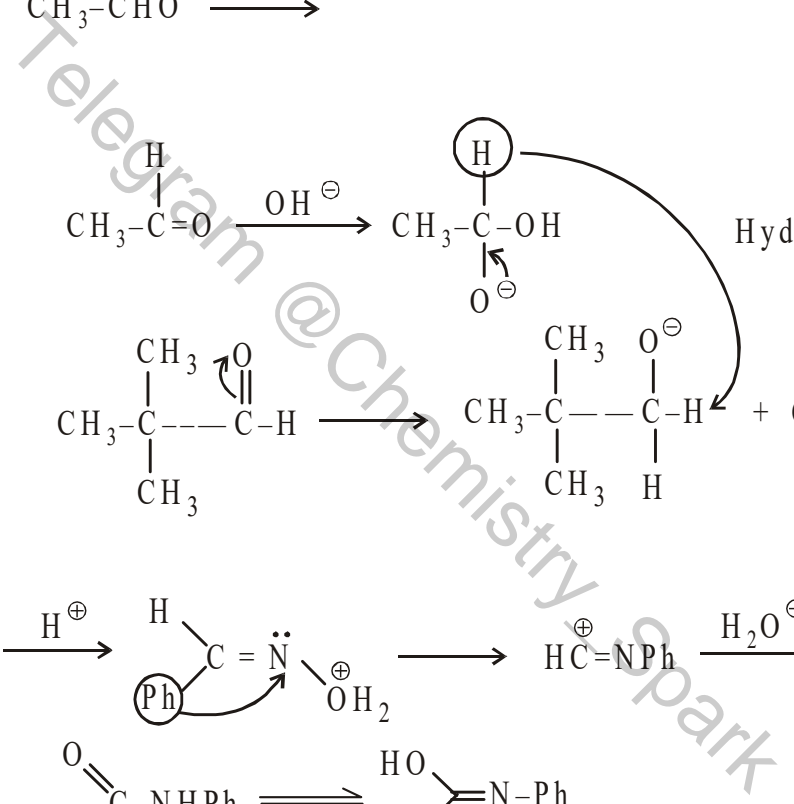


There is no α -H for deprotonation.

(4) cannot be a Claisen product.

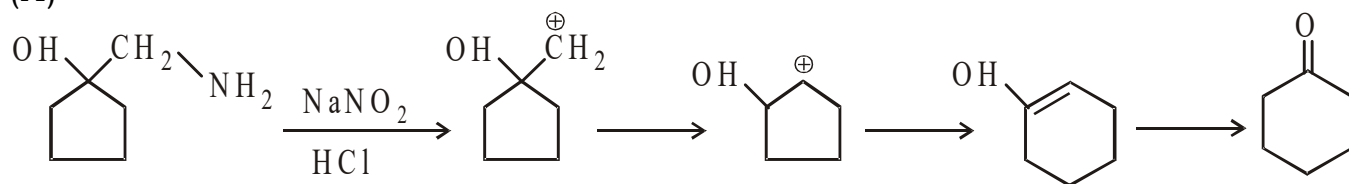
22. CH_3COOH will not respond to iodoform test as the COOH group is more acidic.

23. (A)

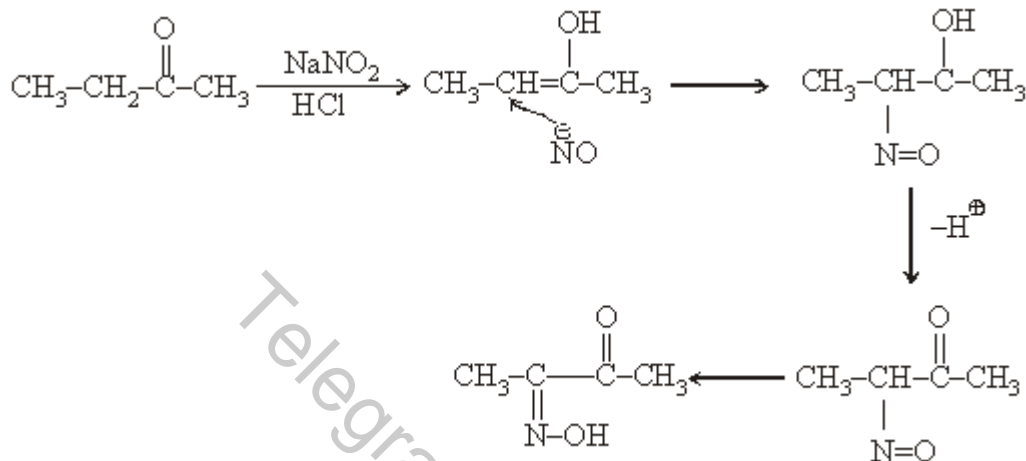


It is intra molecular cannizaro reaction in which no α -hydrogen is present on dialdehyde and it is done by hydride shift

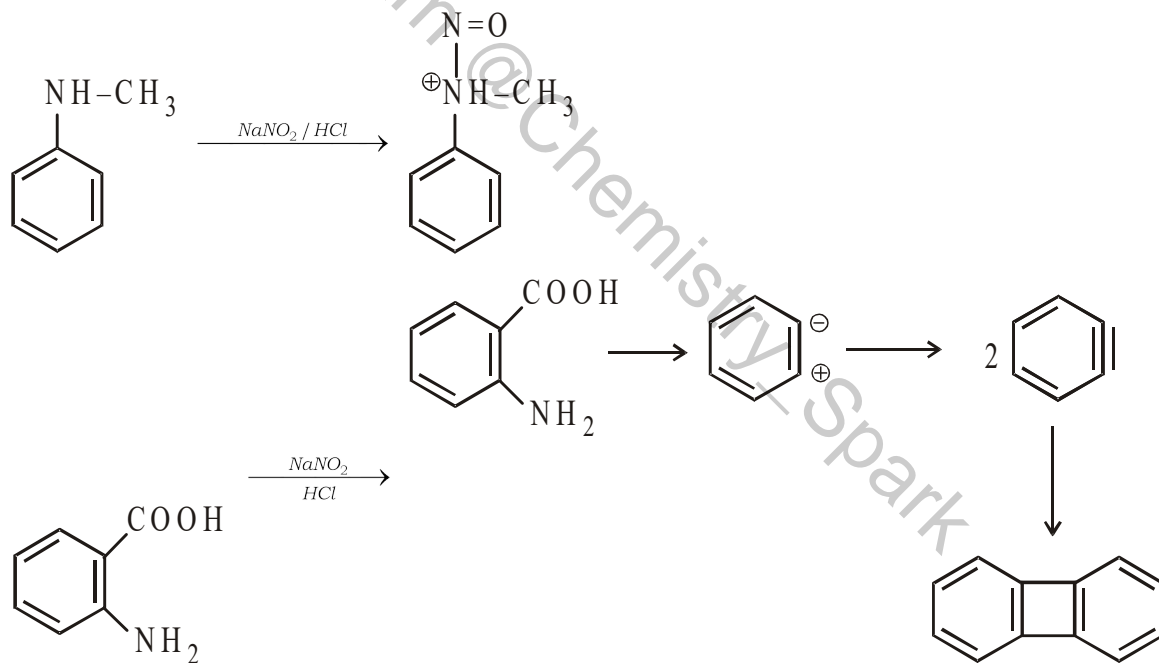
24. (A)



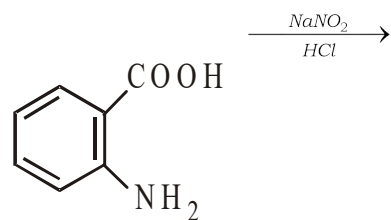
(B)



(C)

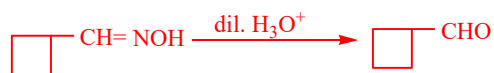


(D)

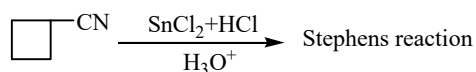


25. Conceptual

26. Conceptual



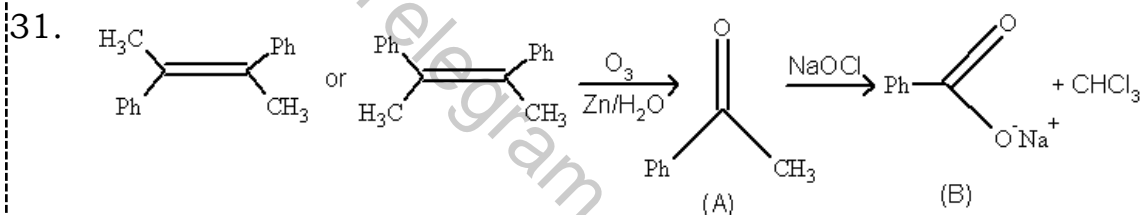
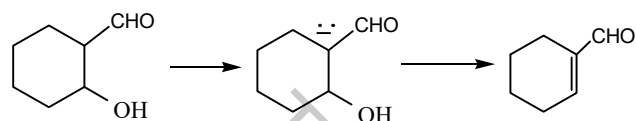
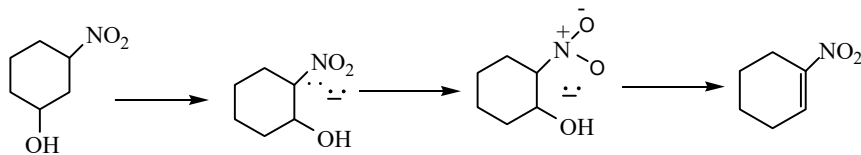
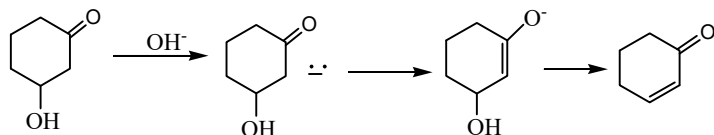
27. Aldoximes on treatment with dilute acid give aldehydes



28. Conceptual

29. Conceptual

30.



32. Conceptual

33. Fact

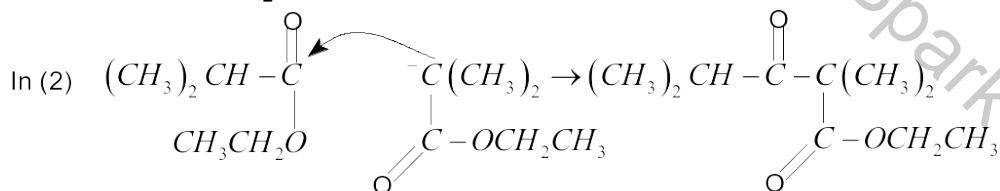
34. Fact

35. Fact

36. Fact

37. Ans: B,D

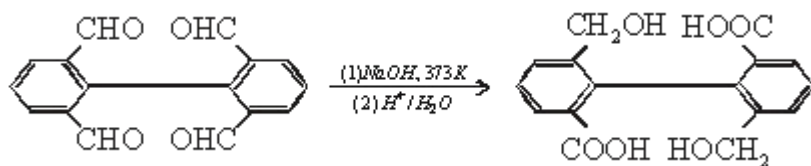
α -H deprotonation is essential in the Claisen condensation, otherwise reaction is not possible.



There is no α -H for deprotonation.

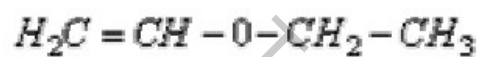
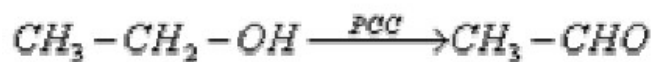
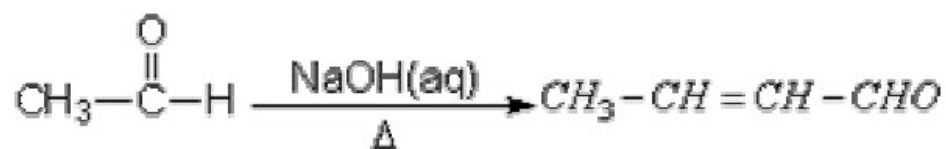
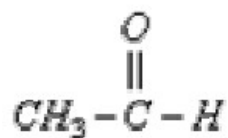
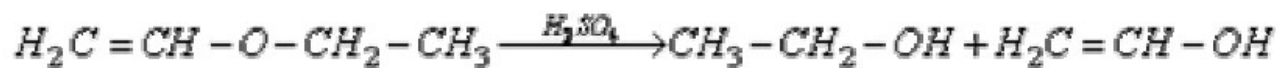
(4) cannot be a Claisen product.

38. (b) Explanation :



It is internal Cannizzaro reaction.

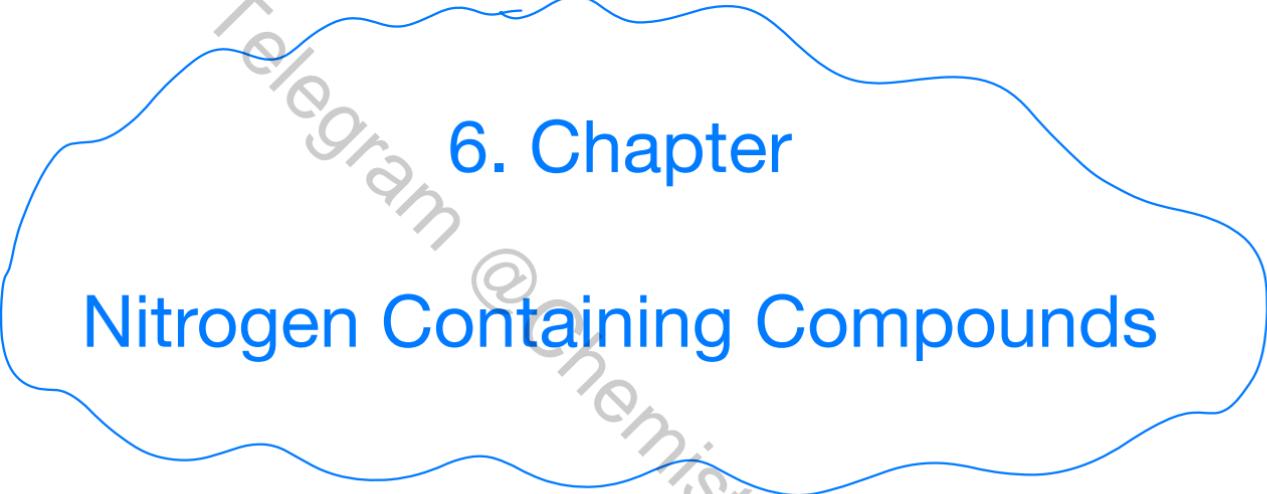
39.



40. Conceptual

41. ABCD

Telegram @Chemistry_Spark



6. Chapter
Nitrogen Containing Compounds

Telegram @chemistry_spark

Tips & Tricks

- ✍ Alkyl nitrites are the esters of nitrous acid.
- ✍ Nitroparaffins are used as solvents for oils, fats, resins, esters, rubbers and cellulose etc. nitromethane is used as high power fuel in racing automobiles.
- ✍ Nitrobenzene is good solvent in friedel crafts reaction because it dissolves $AlCl_3$
- ✍ All amines have basic properties. The basic property, that is, the tendency of primary, secondary and tertiary amines to bind a proton, is due to the unshared pair of electrons on the nitrogen. When a proton is bound, positive ion is formed and originally electrically neutral amine takes on the charge of the proton. When ions are formed in this way, they are called onium ions. The ion formed in case of amines are substituted ammonium ions. The hydronium ion, H_3O^+ is also the onium ion, which belongs to the class of oxonium ions.
- ✍ Some derivatives of ammonia arranged in order of decreasing basicity are $(CH_3)_4N^+OH^-$, $(CH_3)_2NH$, CH_3NH_2 , $(CH_3)_3N$, NH_3 , $C_6H_5NH_2$, $C_6H_5NHCH_3$, $C_6H_5NH_2$, $(C_6H_5)_2NH$, CH_3CONH_2 .
- ✍ In water the basicity follows the order : Primary < Tertiary < Secondary amine, with reference to hydronium ion, H_3O^+ . In this case solvation factor and steric effect alter, to some extent, the order of basicity because of inductive effect alone.
- ✍ In a non-polar solvent such as benzene, using trichloroacetic acid as the reference acid, the basicity follows the order Tertiary < Secondary < Primary amines. The solvation factor is absent but steric effect upsets the inductive effect of alkyl groups.
- ✍ Carylamine test is specific for primary amines.

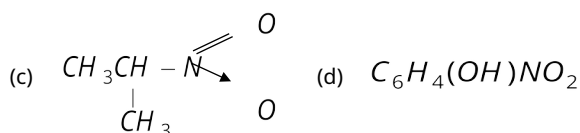
Ordinary Thinking

Objective Questions

Introduction of Nitrogen Containing Compounds

- Cyanide ion is
 - Nucleophilic
 - Electrophilic

- Compounds containing both amino and $COOH$ groups are known as
 - Diamines
 - Unknown
 - Amino acids
 - Enzymes
- Which of the following is 1° amine
 - Ethylene diamine
 - Dimethyl amine
 - Trimethyl amine
 - N*-methyl aniline
- C_3H_9N represents [AMU 1988]
 - Primary amine
 - Secondary amine
 - Tertiary amine
 - All of these
- $(CH_3)_2\overset{\overset{|}{NH_2}}{C}.CH_2.CO.CH_3$ is [MP PET/PMT 1988]
 - Diacetone
 - Acetoneamine
 - Diacetoneamine
 - Aminoacetone
- A secondary amine is [KCET 1992]
 - An organic compound with two $-NH_2$ groups
 - A compound with two carbon atoms and an $-NH_2$ group
 - A compound with an $-NH_2$ group on the carbon atom in number 2 position
 - A compound in which two of the hydrogens of NH_3 have been replaced by organic groups
- The structural formula of methyl aminomethane is [MP PMT 1991]
 - $(CH_3)_2CHNH_2$
 - $(CH_3)_3N$
 - $(CH_3)_2NH$
 - CH_3NH_2
- Allyl isocyanide has [IIT 1995]
 - 9 sigma bonds and 4 pi bonds
 - 8 sigma bonds and 5 pi bonds
 - 8 sigma bonds, 3 pi bonds and 4 non-bonding electrons
 - 9 sigma bonds, 3 pi bonds and 2 non-bonding electrons
- Triaminobenzene is a [BHU 1996]
 - 2° amine
 - 3° amine
 - 1° amine
 - Quarternary salt
- $CH_2=CH-CH_2-NH-CH_3$ is a [RPET 2000]
 - Secondary amine
 - Primary amine
 - Tertiary amine
 - None of these
- Leakage of which gas was responsible for the Bhopal tragedy in 1984 [MP PET 2001]
 - $CH_3-N=C=O$
 - $CH_3-C-N=S$
 - $CHCl_3$
 - C_6H_5COCl
- Which of the following is not a nitro-derivative [DCE 2004]
 - $C_6H_5NO_2$
 - CH_3CH_2ONO

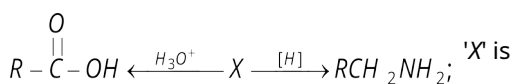


13. Acetonitrile is: [MP PMT 2004]
 (a) $\text{C}_2\text{H}_5\text{CN}$ (b) CH_3CN
 (c) CH_3COCN (d) $\text{C}_6\text{H}_5\text{CH}_2\text{CN}$
14. In alkyl cyanide alkyl group attached with [BCECE 2005]
 (a) C of CN group
 (b) N of CN group
 (c) Either C or N of CN group
 (d) Both C and N of CN group
15. Number of isomeric primary amines obtained from $\text{C}_4\text{H}_{11}\text{N}$ are [DPMT 2005]
 (a) 3 (b) 4
 (c) 5 (d) 6

Preparation of Nitrogen Containing Compounds

1. Amides may be converted into amines by reaction named after [CPMT 1974; MP PET 1992; CBSE PMT 1999]
 (a) Perkin (b) Claisen
 (c) Hoffmann (d) Kolbe
2. Reaction $\text{CH}_3\text{CONH}_2 \xrightarrow{\text{NaOBr}}$ gives [CPMT 1983, 93, 97]
 (a) CH_3Br (b) CH_4
 (c) CH_3COBr (d) CH_3NH_2
3. Acetamide is treated separately with the following reagents. Which would give methyl amine [IIT 1983; CPMT 1988, 94; MP PET 1993; MP PMT 1996; AIIMS 1998]
 (a) PCl_5 (b) $\text{NaOH} + \text{Br}_2$
 (c) Sodalime (d) Hot conc. H_2SO_4
4. The amine formed from an amide by means of bromine and alkali has
 (a) Same number of C atoms as that of amide
 (b) One less C atom than that of amide
 (c) One more C atom than that of amide
 (d) Two more C atoms than that of amide
5. $\text{CH}_3\text{CN} \xrightarrow{\text{Na} + \text{C}_2\text{H}_5\text{OH}} \text{X}$
 The compound X is [MP PMT 1983; BHU 1984]
 (a) CH_3CONH_2 (b) $\text{CH}_3\text{CH}_2\text{NH}_2$
 (c) C_2H_6 (d) CH_3NHCH_3
6. Ethylamine can be prepared by the action of bromine and caustic potash on [CPMT 1994]
 (a) Acetamide (b) Propionamide
 (c) Formamide (d) Methyl cyanide
7. Ethylamine can be obtained by the [CPMT 1985]
 (a) Action of NH_3 on ethyl iodide
 (b) Action of NH_3 on ethyl alcohol
 (c) Both (a) and (b)
 (d) None of the above
8. Aniline is usually purified by [CPMT 1983, 93; JIPMER 1997]
 (a) Steam distillation (b) Simple distillation
 (c) Vacuum distillation (d) Extraction with a solvent
9. Reduction of nitroalkanes yields
 (a) Acid (b) Alcohol
 (c) Amine (d) Diazo compounds
10. Acetamide changes into methylamine by
 (a) Hofmann bromamide reaction
 (b) Hofmann reaction
 (c) Friedel-Craft's reaction
 (d) Hinsberg reaction
11. When methyl iodide is heated with ammonia, the product obtained is
 (a) Methylamine
 (b) Dimethylamine
 (c) Trimethylamine
 (d) A mixture of the above three amines
12. Acetanilide can be prepared from aniline and which of the following
 (a) Ethanol (b) Acetaldehyde
 (c) Acetone (d) Acetic anhydride
13. Reduction of nitroalkanes in neutral medium (e.g. $\text{Zn} / \text{NH}_4\text{Cl}$) forms mainly
 (a) $\text{R} - \text{NH}_2$ (b) $\text{R} - \text{NHOH}$
 (c) $\text{R} - \text{N} = \text{N} - \text{Cl}$ (d) All of these
14. Nitrosobenzene can be prepared by oxidizing aniline from
 (a) H_2SO_4 (b) H_2SO_5
 (c) H_2SO_3 (d) $\text{K}_2\text{Cr}_2\text{O}_7$
15. The Hinsberg's method is used for
 (a) Preparation of primary amines
 (b) Preparation of secondary amines
 (c) Preparation of tertiary amines
 (d) Separation of amine mixtures
16. Which one of the following compound gives a secondary amine on reduction
 (a) Nitromethane (b) Nitrobenzene
 (c) Methyl isocyanide (d) Methyl cyanide
17. Chloropicrin is manufactured by the reaction between Cl_2 , NaOH and
 (a) Nitromethane (b) Nitroethane
 (c) Nitrophenol (d) Nitrostyrene

18. In the reaction



[MP PMT 1990]

- (a) Isonitrile (b) Nitrile
(c) Nitrite (d) Oxime
19. When ethanol is mixed with ammonia and passed over alumina the compound formed is [CBSE PMT 1990]
- (a) $C_2H_5NH_2$ (b) C_2H_4
(c) $C_2H_5OC_2H_5$ (d) CH_3OCH_3
20. Which of the following reactions does not yield an amine

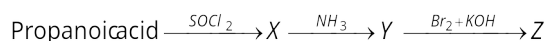
[CPMT 1989, 93]

- (a) $RX + NH_3 \longrightarrow$
(b) $RCH = NOH + [H] \xrightarrow[C_2H_5OH]{Na}$
(c) $RCN + H_2O \xrightarrow{H^+}$
(d) $RCONH_2 + 4H \xrightarrow{LiAlH_4}$
21. Identify 'B' in the reaction
- $$\text{Acetamide} \xrightarrow[\Delta]{P_2O_5} A \xrightarrow{4H} B$$
- [MP PET 1995]
- (a) CH_3NH_2 (b) $CH_3CH_2NH_2$
(c) CH_3CN (d) CH_3COONH_4
22. Which of the following gives primary amine on reduction

[MP PMT 1995]

- (a) $CH_3-CH_2-\overset{\overset{O}{\parallel}}{N} \rightarrow O$
(b) $CH_3-CH_2-O-N=O$
(c) $CH_3CH_2NO_3$
(d) None of these
23. Which of the following is converted into an alcohol on treatment with HNO_2 [MP PET 1996; MP PMT 1999]
- (a) Methyl amine (b) Aniline
(c) Dimethyl amine (d) Triethyl amine
24. Which of the following gives RNC , when reacted with $CHCl_3$ and KOH [MP PET 1996]
- (a) RNH_2 (b) R_2NH
(c) R_3N (d) $R_4N^+Cl^-$
25. When aniline reacts with $NaNO_2$ and dil. HCl at $0^\circ - 5^\circ C$, the product formed is [MP PMT 1996; AIIMS 1996]
- (a) Nitroaniline
(b) Benzene diazonium chloride
(c) Benzene
(d) Trinitroaniline

26. Starting from propanoic acid, the following reactions were carried out

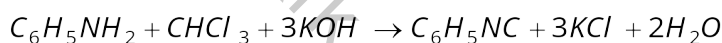


What is the compound Z

- (a) CH_3-CH_2-Br
(b) $CH_3-CH_2-NH_2$
(c) $CH_3-CH_2-\overset{\overset{O}{\parallel}}{C}-Br$
(d) $CH_3-CH_2-CH_2-NH_2$
27. In the reaction
- $$CH_3COOH \xrightarrow{PCl_5} (A) \xrightarrow{NH_3} (B) \xrightarrow{NaBrO} (C).$$
- the final product (C) is
- (a) Ammonium acetate (b) Acetamide
(c) Amino methane (d) Ethanal
28. In the following reaction, X is
- $$X \xrightarrow{\text{Bromination}} Y \xrightarrow{NaNO_2+HCl} Z \xrightarrow[C_2H_5OH]{\text{Boiling}} \text{Tribromobenzene}$$

[CPMT 1999]

- (a) Benzoic acid (b) Salicylic acid
(c) Phenol (d) Aniline
29. Which of the following reactions will not give primary amine
- [CPMT 1999]
- (a) $CH_3CONH_2 \xrightarrow{KOH, Br_2}$
(b) $CH_3CN \xrightarrow{LiAlH_4}$
(c) $CH_3NC \xrightarrow{LiAlH_4}$
(d) $CH_3CONH_2 \xrightarrow{LiAlH_4}$
30. Carbylamine reaction is given by
- [BHU 1996; EAMCET 1990]
- (a) 1° amine (b) 3° amine
(c) 2° amine (d) Quarternary salts
31. The reaction



is known as

[BHU 1996]

- (a) Carbylamine reaction
(b) Reimer-Tiemann reaction
(c) Kolbe reaction
(d) Hofmann's degradation
32. $CH_3CONH_2 \xrightarrow{Na+ROH} Z + H_2O$.
- What is Z? [CPMT 1996]
- (a) $CH_3CH_2NH_2$ (b) CH_3CH_2NC
(c) $CH_3CH_2CH_3$ (d) NH_2CONH_2
33. Which of the following reacts with chloroform and a base to form phenyl isocyanide [AFMC 1997]
- (a) Aniline (b) Phenol
(c) Benzene (d) Nitrobenzene

34. Aromatic primary amine when treated with cold HNO_2 gives [Pb. CET 2002; DCE 1999]

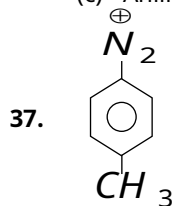
- (a) Benzyl alcohol (b) Nitro benzene
(c) Benzene (d) Diazonium salt

35. Which of the following compound is the strongest base [BHU 1999]

- (a) Ammonia (b) Aniline
(c) Methylamine (d) N-methyl aniline

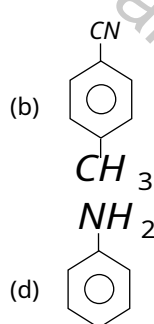
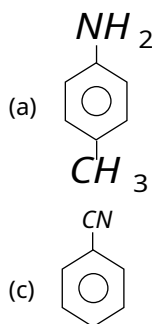
36. Nitrobenzene combines with hydrogen in the presence of platinum to produce [BHU 1999]

- (a) Toluene (b) Benzene
(c) Aniline (d) Azobenzene



The product is

[RPET 2000]



38. Ethyl amine on heating with CS_2 in presence of $HgCl_2$ forms [MP PET 2000]

- (a) C_2H_5NCS (b) $(C_2H_5)_2S$
(c) $(C_2H_5)_2CS$ (d) $C_2H_5(CS)_2$

39. Which of the following reacts with $NaNO_2 + HCl$ to give phenol [MP PMT 2000]

- (a) $C_6H_5CH_2NHCH_3$ (b) $(CH_3)_2NH$
(c) CH_3NH_2 (d) $C_6H_5NH_2$

40. Which of the following reactions give $RCONH_2$ [Roorkee 2000]

- (a) $R-C \equiv N + H_2O \xrightarrow{HCl}$
(b) $RCOONH_4 \xrightarrow{\text{heat}}$
(c) $R-COCl + NH_3 \longrightarrow$
(d) $(RCO)_2O + NH_3 \longrightarrow$

41. When chlorobenzene is treated with NH_3 in presence of Cu_2O in xylene at 570 K. The product obtained is [Pb. PMT 2000]

- (a) Benzylamine (b) Diazonium salt
(c) Schiff's base (d) Aniline

42. Nitrobenzene can be prepared from benzene by using a mixture of conc. HNO_3 and conc. H_2SO_4 . In the nitrating mixture, HNO_3 acts as a [BHU 2001]

- (a) Base (b) Acid
(c) Catalyst (d) Reducing agent

43. The rate determining step for the preparation of nitrobenzene from benzene is [AIIMS 2001]

- (a) Removal of NO_2^+ (b) Removal of NO_3^+
(c) Formation of NO_2^+ (d) Formation of NO_3^+

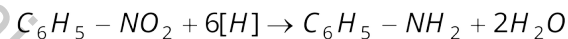
44. In this reaction $C_6H_5NH_2 + HCl + NaNO_2 \rightarrow X$. Product X is [RPMT 2002; AFMC 2002]

- (a) Aniline hydrochloride
(b) Nitro aniline
(c) Benzenediazonium chloride
(d) None of these

45. The diazonium salts are the reaction products in presence of excess of mineral acid with nitrous acid and [MP PET 2002]

- (a) Primary aliphatic amine
(b) Secondary aromatic amine
(c) Primary aromatic amine
(d) Tertiary aliphatic amine

46. In acid medium nitrobenzene is reduced to aniline as shown in the reaction



The reducing agent used in this reaction is

[Orissa JEE 2002]

- (a) $LiAlH_4$ (b) Sn/HCl
(c) Na/alc (d) H_2/Ni

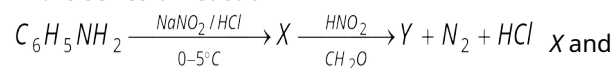
47. When aniline is treated with sodium nitrite and hydrochloric acid at $0^\circ C$, it gives [Orissa JEE 2003]

- (a) Phenol and N_2 (b) Diazonium salt
(c) Hydrazo compound (d) No reaction takes place

48. $CH_3NO_2 \xrightarrow{Sn+HCl} CH_3X$, the 'X' contain [CPMT 2003]

- (a) $-NH_2$ (b) $-COOH$
(c) $-CHO$ (d) $(CH_3CO)_2O$

49. In the series of reaction



X and Y are respectively [EAMCET 2003]

- (a) $C_6H_5-N=N-C_6H_5$, $C_6H_5N_2^+Cl^-$
(b) $C_6H_5N_2^+Cl^-$, $C_6H_5-N=N-C_6H_5$
(c) $C_6H_5N_2^+Cl^-$, $C_6H_5NO_2$

(d) $C_6H_5NO_2, C_6H_6$

50. Aromatic nitriles ($ArCN$) are not prepared by reaction
[AIIMS 2004]

(a) $ArX + KCN$ (b) $ArN_2^+ + CuCN$

(c) $ArCONH_2 + P_2O_5$ (d)

$ArCONH_2 + SOCl_2$

51. An organic amino compound reacts with aqueous nitrous acid at low temperature to produce an oily nitroso amine. The compound is :
[DCE 2003]

(a) CH_3NH_2 (b) $CH_3CH_2NH_2$

(c) $CH_3CH_2NH.CH_2CH_3$ (d) $(CH_3CH_2)_3$

52. Azo-dyes are prepared from : [BHU 2004; Pb. CET 2001]

(a) Aniline (b) Salicylic acid
(c) Benzaldehyde (d) Chlorobenzene

53. Gabriel's phthalimide synthesis is used for the preparation of

[CPMT 1982; DPMT 1983]

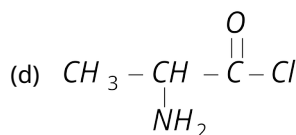
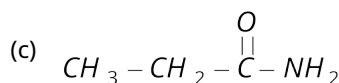
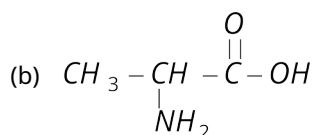
(a) Primary aromatic amine (b) Secondary amine
(c) Primary aliphatic amine (d) Tertiary amine

54. For the preparation of *p*-nitroiodobenzene from *p*-nitroaniline, the best method is [Orissa JEE 2005]

(a) $NaNO_2/HCl$ followed by KI
(b) $NaNO_2/HCl$ followed by $CuCN$
(c) $LiAlH_4$ followed by I_2
(d) $NaBH_4$ followed by I_2

55. KCN reacts readily to give a cyanide with [J & K 2005]

(a) Ethyl alcohol (b) Ethyl bromide
(c) Bromobenzene (d) Chlorobenzene



4. Nitro group in nitrobenzene is a [MNR 1986]

(a) Ortho director (b) Meta director
(c) Para director (d) Ortho and para director

5. The alkyl cyanides are

(a) Acidic (b) Basic
(c) Neutral (d) Amphoteric

6. The alkyl cyanides when hydrolysed to the corresponding acid, the gas evolved is

(a) N_2 (b) O_2
(c) NH_3 (d) CO_2

7. Aniline when treated with HNO_2 and HCl at $0^\circ C$ gives

[CPMT 1982, 89; RPMT 2000]

(a) Phenol (b) Nitrobenzene
(c) A diazo compound (d) None of these

8. Nitrosobenzene can be isolated from nitrobenzene under

[DPMT 1982]

(a) Metal and acid
(b) Zn dust and NH_4Cl
(c) Alkaline sodium arsenite
(d) Cannot be isolated

9. Alkyl cyanides when react with Grignard reagent, the product on hydrolysis found, is [MP PMT 1980]

(a) Aldehyde (b) Ketone
(c) Alcohol (d) Acid

10. The product formed when benzene is nitrated by fuming nitric acid is [MP PMT 1979]

(a) *m*-dinitrobenzene (b) Nitrobenzene
(c) *sym*-trinitrobenzene (d) None of these

11. Ethyl amine undergoes oxidation in the presence of $KMnO_4$ to form [CPMT 1985]

(a) An acid (b) An alcohol
(c) An aldehyde (d) A nitrogen oxide

12. Which of the following amines would undergo diazotisation

(a) Primary aliphatic amines (b) Primary aromatic amines

(c) Both (a) and (b) (d) None of these

13. Reaction of primary amines with aldehyde yields

Properties of Nitrogen Containing Compounds

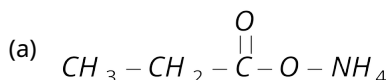
1. Which of the following amine will not react with nitrous acid to give nitrogen
[NCERT 1984]

(a) CH_3NH_2 (b) $CH_3 - CH_2 - NH_2$
 $CH_3 - \underset{\substack{| \\ CH_3}}{CH} - NH_2$ (c) (d) $(CH_3)_3N$

2. Which of the following compound is expected to be most basic [NCERT 1982]

(a) Aniline (b) Methylamine
(c) Hydroxylamine (d) Ethylamine

3. Which of the following compounds is an amino acid [Manipal MEE 1995]



[NCERT 1984; Manipal MEE 1995]

- (a) Amides (b) Aldimines
(c) Nitriles (d) Nitro compounds

14. When acetamide is treated with HNO_2 , the gas is evolved

[CPMT 1993]

- (a) H_2 (b) O_2
(c) N_2 (d) CH_4

15. Nitrobenzene on nitration gives

[NCERT 1978; CPMT 1989]

- (a) *o*-dinitrobenzene (b) *p*-dinitrobenzene
(c) *m*-dinitrobenzene (d) *o*- and *p*-nitrobenzene

16. Reduction of alkyl nitrites yields

- (a) Alcohol (b) Base
(c) Amine (d) Acid

17. When primary amines are treated with HCl , the product obtained is

- (a) An alcohol (b) A cyanide
(c) An amide (d) Ammonium salt

18. Which one is weakest base [BHU 1982; RPMT 2000]

- (a) Ammonia (b) Methylamine
(c) Dimethylamine (d) Trimethylamine

19. Chloroform when treated with aniline and alcoholic KOH gives [CPMT 1986; EAMCET 1992; MP PMT 1997; Pb. PMT 1999]

- (a) Phenyl cyanide (b) Phenyl isocyanide
(c) Chlorobenzene (d) Phenol

20. Which of following do not react with HNO_2

- (a) Primary nitroalkanes (b) Secondary nitroalkanes

- (c) Tertiary nitroalkanes (d) All of these

21. Primary amines can be distinguished from secondary and tertiary amines by reacting with [CPMT 1983]

- (a) Chloroform and alcoholic KOH
(b) Methyl iodide
(c) Chloroform alone
(d) Zinc dust

22. Which of following is not an usual method for preparation of primary amine

- (a) Hofmann's method (b) Curtius reaction
(c) Schmidt reaction (d) Friedel-Craft's reaction

23. A solution of methyl amine

- (a) Turns blue litmus red
(b) Turns red litmus blue
(c) Does not affect red or blue litmus
(d) Bleaches litmus

24. Mark the correct statement

[CPMT 1974; DPMT 1983; MP PMT 1994]

- (a) Methyl amine is slightly acidic

- (b) Methyl amine is less basic than NH_3

- (c) Methyl amine is stronger base than NH_3

- (d) Methyl amine forms salts with alkalies

25. The product of mustard oil reaction is

- (a) Alkyl isothiocyanate (b) Dithio carbonamide
(c) Dithio ethylacetate (d) Thioether

26. Which of the following is azo- group

- (a) $-N =$ (b) $-N = N -$
(c) $-NH -$ (d) $-CO - NH -$

27. 'Oil of mirbane' is

- (a) Aniline (b) Nitrobenzene
(c) *p*-nitroaniline (d) *p*-aminoazobenzene

28. The maximum number of $-NO_2$ groups that can be introduced by nitration in benzene is usually

- (a) 4 (b) 2
(c) 3 (d) 6

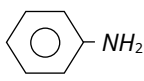
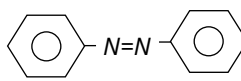
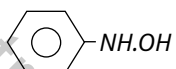
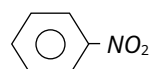
29. Nitrobenzene at room temperature is

- (a) Gas (b) Liquid
(c) Solid (d) Solution

30. In the explosive amatol, TNT is mixed with [CPMT 1988]

- (a) Ammonium citrate (b) Ammonium nitrate
(c) Ammonium oxalate (d) Ammonium sulphate

31. By reduction of nitrosobenzene which of the following is not obtained

- (a)  (b) 
(c)  (d) 

32. By the presence of a halogen atom in the ring, basic properties of aniline is

- (a) Increased (b) Decreased
(c) Unchanged (d) Doubled

33. In the mustard oil reaction, an amine is treated with

- (a) Na / C_2H_5OH (b) Sn / HCl
(c) CS_2 (d) $K_2Cr_2O_7 / H_2SO_4$

34. Primary nitro compounds when react with HNO_2 forms crystalline solids which on treatment with $NaOH$ gives

- (a) Red solution (b) Blue solution
(c) White precipitate (d) Yellow colouration

35. Secondary nitro compounds when react with HNO_2 forms crystalline solids which one on treatment with $NaOH$ gives

- (a) Red solution (b) Blue solution
(c) White precipitate (d) Yellow colouration

36. Which of the following possess powerful mustard smell (and are called mustard oils)

- (a) Alkyl isocyanates (b) Alkyl cyanates
(c) Alkyl isothiocyanates (d) Alkyl thiocyanates
37. On heating acetamide in presence of P_2O_5 , which of the following is formed [MP PMT 1992; MP PET 1994; Kurukshetra CEE 1998]
(a) Ammonium acetate (b) Acetonitrile
(c) NH_3 (d) Methylamines
38. When chloroform reacts with ethyl amine in presence of alcoholic KOH , the compound formed is [CPMT 1983; MP PMT 1993; CBSE PMT 1997; BHU 1999; AIEEE 2002]
(a) Ethyl cyanide (b) Ethyl isocyanide
(c) Formic acid (d) An amide
39. When methyl cyanide is hydrolysed in presence of alkali, the product is [MP PMT 1993; BCECE 2005]
(a) Acetamide (b) Methane
(c) $CO_2 + H_2O$ (d) Acetic acid
40. Hofmann's hypobromite reaction affords a method of [MP PMT 1993]
(a) Preparing a tertiary amine
(b) Preparing a mixture of amines
(c) Stepping down a series
(d) Stepping up a series
41. The compound which on reaction with aqueous nitrous acid on HNO_2 at low temperature produces an oily nitrosoamine is [IIT 1981; CPMT 1989; MP PET/PMT 1998; Kurukshetra CEE 1998; MP PMT 2001]
(a) Diethylamine (b) Ethylamine
(c) Aniline (d) Methylamine
42. Identify the product Z in the series

$$CH_3CN \xrightarrow{Na+C_2H_5OH} X \xrightarrow{HNO_2} Y \xrightarrow[H_2SO_4]{K_2Cr_2O_7} Z$$
 [AIIMS 1983; JIPMER 2001]
 (a) CH_3CHO (b) CH_3CONH_2
 (c) CH_3COOH (d) CH_3CH_2NHOH
43. The end product of the reactions is

$$C_2H_5NH_2 \xrightarrow{HNO_2} A \xrightarrow{PCl_5} B \xrightarrow{H.NH_2} C$$
 [CPMT 1988, 89, 93; DCE 1999; JIPMER 2000]
 (a) Ethyl cyanide (b) Ethyl amine
 (c) Methyl amine (d) Acetamide
44. Primary and secondary amines are distinguished by [AMU 1988; MP PMT 1996]
(a) Br_2 / KOH (b) $HClO_4$
(c) HNO_2 (d) NH_3
45. Which one of the following will give a primary amine on hydrolysis [BHU 1982]
(a) Nitroparaffin (b) Alkyl cyanide
(c) Oxime (d) Alkyl isocyanide
46. Methyl amine reacts with HNO_2 giving [RPMT 1997]
(a) $CH_3O - N = O$ (b) $CH_3 - O - CH_3$
(c) CH_3OH (d) (a) and (b) both
47. Nitrobenzene on reduction by zinc and NH_4Cl gives [CPMT 1989, 94; BHU 1996; Pb. PMT 1999]
(a) Aniline (b) Nitrosobenzene
(c) Hydrazobenzene (d) Phenylhydroxyl amine
48. The decreasing order of the basic character of the three amines and ammonia is [MP PET/PMT 1988; KCET 1990]
(a) $NH_3 > CH_3NH_2 > C_2H_5NH_2 > C_6H_5NH_2$
(b) $C_2H_5NH_2 > CH_3NH_2 > NH_3 > C_6H_5NH_2$
(c) $C_6H_5NH_2 > C_2H_5NH_2 > CH_3NH_2 > NH_3$
(d) $CH_3NH_2 > C_2H_5NH_2 > C_6H_5NH_2 > NH_3$
49. Correct order of increasing basicity is [CBSE PMT 1992]
(a) $NH_3 < C_6H_5NH_2 < (C_2H_5)_2NH < C_2H_5NH_2 < (C_2H_5)_3N$
(b) $C_6H_5NH_2 < NH_3 < (C_2H_5)_3N < (C_2H_5)_2NH < C_2H_5NH_2$
(c) $C_6H_5NH_2 < NH_3 < C_2H_5NH_2 < (C_2H_5)_3N < (C_2H_5)_2NH$
(d) $C_6H_5NH_2 < (C_2H_5)_3N < NH_3 < C_2H_5NH_2 < (C_2H_5)_2NH$
50. Among the following compounds nitrobenzene, benzene, aniline and phenol, the strongest basic behaviour in acid medium is exhibited by [KCET 1993]
(a) Phenol (b) Aniline
(c) Nitrobenzene (d) Benzene
51. Aniline on treatment with excess of bromine water gives [AFMC 1990; MP PMT 1991; RPMT 1997]
(a) Aniline bromide (b) o-bromoaniline
(c) p-bromoaniline (d) 2, 4, 6-tribromoaniline
52. Unpleasant smelling carbylamines are formed by heating alkali and chloroform with [KCET 1987, 2000, 01]
(a) Any amine (b) Any aliphatic amine
(c) Any aromatic amine (d) Any primary amine
53. When an organic compound was treated with sodium nitrite and hydrochloric acid in the ice cold, nitrogen gas was evolved copiously. The compound is [KCET 1986]
(a) A nitro compound
(b) A primary amine
(c) An aliphatic primary amine
(d) An aromatic primary amine
54. Aniline reacts with alkyl halide to give [KCET 1984]
(a) Amino compound
(b) Tertiary compound
(c) Quaternary ammonium compound
(d) Azomethane

55. Aniline on treatment with conc. HNO_3 + conc. H_2SO_4 mixture yields [AIIMS 1992]

- (a) *o*- and *p*-nitroanilines (b) *m*-nitroanilines
(c) A black tarry matter (d) No reaction

56. Which statement is not correct [MP PMT 1995]

- (a) Amines form hydrogen bond
(b) Ethyl amine has higher boiling point than propane
(c) Methyl amine is more basic than ammonia
(d) Dimethyl amine is less basic than methyl amine

57. Which of the following is not used as an explosive

[MP PET 1996]

- (a) Trinitrotoluene (b) Trinitrobenzene
(c) Picric acid (d) Nitrobenzene

58. Primary amines react with nitrous acid to yield

- (a) Insoluble nitrite salts (b) Yellow oily layer
(c) Nitrogen gas (d) Azo dye

59. Which of the following has the smell of bitter almonds

- (a) Nitromethane (b) Nitroethane
(c) Nitrobenzene (d) Aniline

60. The reaction of HNO_2 with 'A' gives quaternary ammonium salt. A is [MP PMT 1997]

- (a) Methyl amine (b) Dimethyl amine
(c) Trimethyl amine (d) Aniline

61. Reaction of nitrous acid with aliphatic primary amine in the cold gives [MP PET/PMT 1998; CBSE PMT 1994]

- (a) A diazonium salt (b) An alcohol
(c) A nitrite (d) A dye

62. In presence of acid, hydrolysis of methyl cyanide gives

[MP PET/PMT 1998]

- (a) Acetic acid (b) Methylamine
(c) Methyl alcohol (d) Formic acid

63. The amine which does not react with acetyl chloride is or Which of the following cannot be acetylated

[MP PET 1999; MP PMT 1999]

- (a) CH_3NH_2 (b) $(CH_3)_2NH$
(c) $(CH_3)_3N$ (d) None of these

64. The fusion of sodium with amine gives mainly

[MP PMT 1999; CPMT 2002]

- (a) $NaCN$ (b) NaN_3
(c) $NaSCN$ (d) $NaNO_2$

65. Which of the following is most basic [MP PMT 1999]

- (a) $C_6H_5NH_2$ (b) $(CH_3)_2NH$
(c) $(CH_3)_3N$ (d) NH_3

66. In reaction



[CBSE PMT 1999]

- (a) Acetone (b) Ethylamine
(c) Acetaldehyde (d) Dimethylamine

67. The following compound can be classified as *N-N* dimethyl propanamine, *N*-methyl aniline and aniline

[Bihar MEE 1996]

- (a) Primary, secondary, tertiary
(b) Primary, tertiary, secondary
(c) Secondary, tertiary, primary
(d) Tertiary, primary, secondary
(e) None of these

68. Which of the following compounds does not react with $NaNO_2$ and HCl [KCET 1996]

- (a) C_6H_5OH (b) $C_6H_5NH_2$
(c) $(CH_3)_3CNO_2$ (d) $(CH_3)_3CHNO_2$

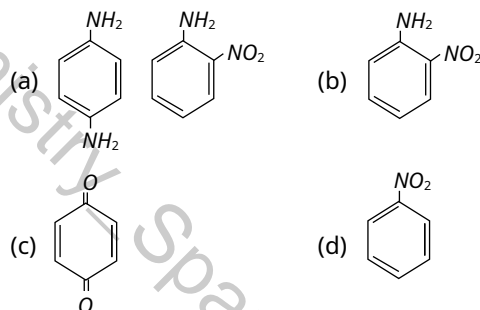
69. In the reduction of nitrobenzene, which of the following is the intermediate

[CPMT 1999]

- (a) $C_6H_5N=O$
(b) $C_6H_5NH-NH-C_6H_5$
(c) $C_6H_5-N=N-C_6H_5$
(d) $C_6H_5N=\overset{O}{\underset{\uparrow}{N}}-C_6H_5$

70. Aniline when treated with conc. HNO_3 gives

[KCET 1996]



71. Which one of the following is not a base [EAMCET 1997]

- (a) N_2H_4 (b) NH_2OH
(c) $(CH_3)_3N$ (d) HN_3

72. *p*-Nitrobromobenzene can be converted to *p*-nitroaniline by using $NaNH_2$. The reaction proceeds through the intermediate named [Orissa JEE 2005]

- (a) Carbocation (b) Carbanion
(c) Benzyne (d) Dianion

73. If methyl is alkyl group, then which order of basicity is correct [RPMT 1997]

- (a) $R_2NH > RNH_2 > R_3N > NH_3$
(b) $R_2NH > R_3N > RNH_2 > NH_3$
(c) $RNH_2 > NH_3 > R_2NH > R_3N$
(d) $NH_3 > RNH_2 > R_2NH > R_3N$

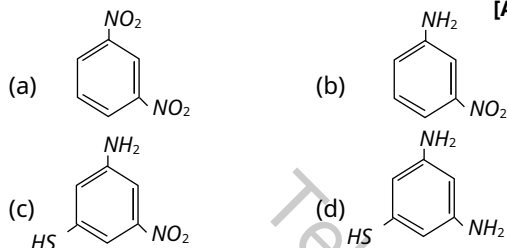
74. Which of the following has the minimum heat of dissociation

[Roorkee Qualifying 1998]

- (a) $(CH_3)_3N \rightarrow BF_3$
 (b) $(CH_3)_3N \rightarrow B(CH_3)F_2$
 (c) $(CH_3)_3N \rightarrow B(CH_3)_2F$
 (d) $(CH_3)_3N \rightarrow B(CH_3)_3$

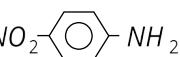


75. The major product (70% to 80%) of the reaction between *m*-dinitrobenzene with NH_4HS is

[AIIMS 1997]



76. Which one is less alkaline

[CPMT 1997]

- (a)  (b) 
 (c)  (d) All of these

77. In the diazotisation of aniline with sodium nitrite and hydrochloric acid, an excess of hydrochloric acid is used primarily to

[Pb. PMT 1998]

- (a) Suppress the concentration of free aniline available for coupling
 (b) Suppress hydrolysis of phenol
 (c) Insure a stoichiometric amount of nitrous acid
 (d) Neutralize the base liberated

78. A primary amine can be converted to an alcohol by the action of

[CET Pune 1998]

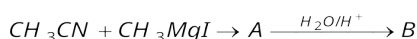
- (a) Alkali (b) Nitrous acid
 (c) Reducing agent (d) Oxidising agent

79. Arrange the following in increasing order of basicity CH_3NH_2 , $(CH_3)_2NH$, $C_6H_5NH_2$, $(CH_3)_3N$

[AFMC 1997]

- (a) $(CH_3)_3N < (CH_3)_2NH < CH_3NH_2 < C_6H_5NH_2$
 (b) $(CH_3)_3N > (CH_3)_2NH > CH_3NH_2 > C_6H_5NH_2$
 (c) $C_6H_5NH_2 < (CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$
 (d) $C_6H_5NH_2 > (CH_3)_3N > CH_3NH_2 > (CH_3)_2NH$

80. In the reaction



The compound B is

[KCET 1999]

- (a) Acetic acid (b) Acetone
 (c) Acetaldehyde (d) Ethyl alcohol

81. CH_3CN is known as acetonitrile because [AMU 1999]

- (a) It contains an aceto group
 (b) On hydrolysis it gives acetic acid
 (c) Both (a) and (b)
 (d) None of these

82. What is formed, when nitrobenzene is reduced using zinc and alkali

[BHU 2000; AIIMS 2000; CBSE PMT 2000; MH CET 2003]

- (a) Phenol (b) Aniline
 (c) Nitrosobenzene (d) Hydrazobenzene

83. $RCOCl + 2Me_2NH \rightarrow A + Me_2NH_2Cl^+$

Here A is

[RPET 2000]

- (a) $RCON \begin{matrix} Me \\ \diagdown \\ Me \end{matrix}$ (b) $RCONH_2$
 (c) $RCONHMe$ (d) $(RCO)_2NH$

84. Decreasing order of basicity is

[RPET 2000]

- (1) CH_3CONH_2 (2) $CH_3CH_2NH_2$
 (3) $Ph-CH_2CONH_2$
 (a) $1 > 2 > 3$ (b) $2 > 1 > 3$
 (c) $3 > 2 > 1$ (d) None of these

85. Among the following, the strongest base is

[UPSEAT 2000; IIT-JEE (Screening) 2000]

- (a) $C_6H_5NH_2$ (b) $p-NO_2C_6H_4NH_2$
 (c) $m-NO_2-C_6H_4NH_2$ (d) $C_6H_5CH_2NH_2$

86. Aniline and methyl amine can be differentiated by

[DPMT 2000]

- (a) Reaction with chloroform and aqueous solution of KOH
 (b) Diazotisation followed by coupling with phenol
 (c) Reaction with HNO_2
 (d) None of these

87. The amine which can react with $C_6H_5-SO_2-Cl$ to form a product insoluble in alkali shall be

[AMU 2000]

- (a) Primary amine
 (b) Secondary amine
 (c) Tertiary amine
 (d) Both primary and secondary amines

88. A mixture of benzene and aniline can be separated by

[KCET (Engg.) 2001]

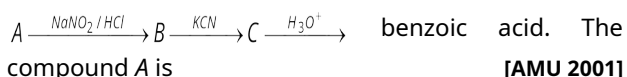
- (a) Hot water (b) dil. HCl
 (c) dil. NaOH (d) Alcohol

89. Nitrobenzene on further excessive nitration gives

[AFMC 2001]

- (a) Trinitrobenzene (b) *m*-dinitrobenzene
 (c) *p*-dinitrobenzene (d) All of these

90. The compound A with following sequence of reaction gave benzoic acid



[AMU 2001]

- (a) Nitrobenzene (b) Aniline
(c) Benzaldehyde (d) Amides
91. Which of the following chemicals are used to manufacture methyl isocyanate that caused "Bhopal Tragedy"

- (i) Methylamine (ii) Phosgene
(iii) Phosphine (iv) Dimethylamine

[AIIMS 2005]

- (a) (i) and (iii) (b) (iii) and (iv)
(c) (i) and (ii) (d) (ii) and (iv)

92. An isocyanide on hydrolysis gives [AMU 2001]

- (a) An amide
(b) A carboxylic acid and ammonia
(c) A N-substituted amide
(d) A 1°-amine and formic acid

93. Methyl isocyanide on hydrolysis gives [UPSEAT 2001]

- (a) CH_3NH_2 (b) HCOOH
(c) CH_3COOH (d) Both (a) and (b)

94. Pure aniline is a [UPSEAT 2001]

- (a) Colourless solid
(b) Brown coloured solid
(c) Colourless liquid
(d) Brown coloured liquid

95. Reduction of methyl isocyanide gives [RPMT 2002]

- (a) Ethylamine (b) Methylamine
(c) Dimethylamine (d) Trimethylamine

96. Reaction of aniline with benzaldehyde is [RPMT 2002]

- (a) Polymerisation (b) Condensation
(c) Addition (d) Substitution

97. In the reaction $\text{C}_6\text{H}_5\text{CHO} + \text{C}_6\text{H}_5\text{NH}_2 \rightarrow \text{C}_6\text{H}_5\text{N} = \text{HCC}_6\text{H}_5 + \text{H}_2\text{O}$, the compound $\text{C}_6\text{H}_5\text{N} = \text{CHC}_6\text{H}_5$ is known as

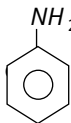
[RPMT 2000; AIIMS 2002; AMU 2001]

- (a) Aldol (b) Schiff's reagent
(c) Schiff's base (d) Benedict reagent

98. The unshared pair of electrons on a cyanide ion can acts as

[Kerala (Med.) 2002]

- (a) Isocyanide centre (b) Amido centre
(c) Cationic centre (d) Nucleophilic centre

99. Electrophilic substitution  with bromine gives

[Kerala (Med.) 2002]

- (a) 1, 4, 6-tribromo aniline

- (b) 2, 4, 6-tribromo aniline
(c) 4-bromo aniline
(d) 3-bromo aniline

100. Mustard gas is obtained by [MP PET 2002]

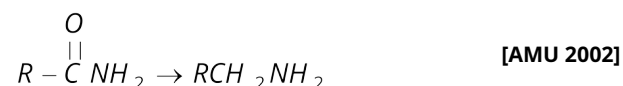
- (a) The action of dilute acids on mustard seeds
(b) Treating ethylene with mustard oil
(c) Treating sulphur chloride with ethylene
(d) None of these

101. Which of the following is capable of forming a zwitter ion

[JIPMER 2002]

- (a) $\text{C}_6\text{H}_5 - \text{OH}$ (b) $\text{C}_6\text{H}_4(\text{NH}_2)_2$
(c) CH_2OH
(d) $\text{H}_2\text{N} - \text{CH}_2 - \text{COOH}$

102. Which one of the following reducing agents is likely to be the most effective in bringing about the following change



[AMU 2002]

- (a) $\text{H}_2 - \text{Ni}$ (b) NaBH_4
(c) LiAlH_4 (d) Na-alcohol

103. During acetylation of amines what is replaced by acetyl groups [UPSEAT 2002]

- (a) Hydrogen atom attached to nitrogen atom
(b) One or more hydrogen atoms attached to carbon atom
(c) One or more hydrogen atoms attached to nitrogen atom
(d) Hydrogen atoms attached to either carbon atom or nitrogen atom

104. Hydrolysis of acetonitrile in acidic medium produces [CPMT 2003; RPMT 2003]

- (a) $\text{CH}_3\text{CH}_2\text{OH}$ (b) CH_3COOH
(c) CH_3NC (d) $\text{CH}_3\text{COOCH}_3$

105. Which has a pyramidal structure [UPSEAT 2003]

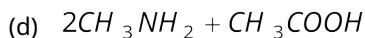
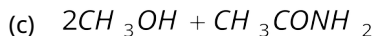
- (a) Trimethylamine (b) Methanol
(c) Acetylene (d) Water

106. Ethyl amine on acetylation gives [BHU 2002; BVP 2003]

- (a) N-ethyl acetamide
(b) Acetamide
(c) Methyl acetamide
(d) None

107. The refluxing of $(\text{CH}_3)_2\text{NCOCH}_3$ with acid gives

[BHU 2002; BVP 2003]



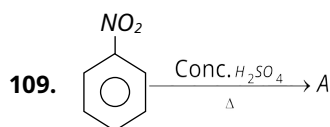
108. *p*-chloro aniline and anilinium hydrogen chloride can be distinguished by [UPSEAT 2003]

(a) Sandmeyer reaction

(b) Carbyl amine reaction

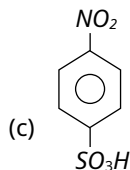
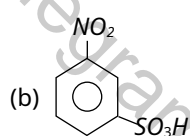
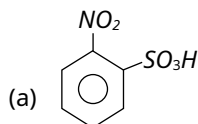
(c) Hinsberg's reaction

(d) $AgNO_3$



Product 'A' in above reaction is

[RPMT 2003]



(d) None of these

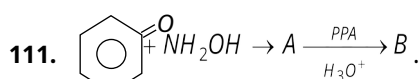
110. Product obtained by electrolytic reduction of nitrobenzene in presence of H_2SO_4 is [RPMT 2003]

(a) *o*-amino phenol

(b) *m*-amino phenol

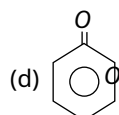
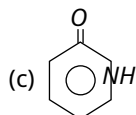
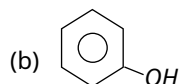
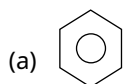
(c) *p*-amino phenol

(d) None of these

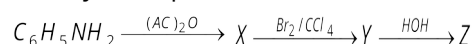


The product 'B' is

[RPMT 2003]



112. Identify the product Z in the following reaction



[Kerala (Med.) 2003]

(a) *p*-Bromoaniline

(b) *p*

Bromoacetophenone

(c) *o*-Bromoacetophenone (d) *o*-Bromoacetanilide

113. Benzaldehyde condenses with *N,N*-dimethylaniline in presence of anhydrous $ZnCl_2$ to give [Kerala (Med.) 2003]

(a) Michler's ketone

(b) Azo dye

(c) Malachite green

(d) Buffer yellow

114. The correct order of reactivity towards the electrophilic substitution of the compounds aniline (I) benzene (II) and nitrobenzene (III) is [CBSE PMT 2003]

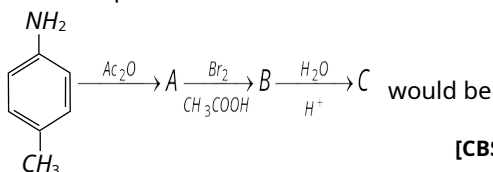
(a) $I > II > III$

(b) $III > II > I$

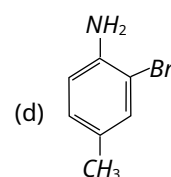
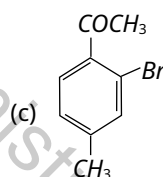
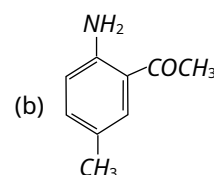
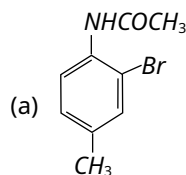
(c) $II > III > I$

(d) $I < II > III$

115. The final product C, obtained in this reaction



[CBSE PMT 2003]



116. The correct order of increasing basic nature for the bases NH_3 , CH_3NH_2 and $(CH_3)_2NH$ is [AIIEE 2003]

(a) $CH_3NH_2 < NH_3 < (CH_3)_2NH$

(b) $(CH_3)_2NH < NH_3 < CH_3NH_2$

(c) $NH_3 < CH_3NH_2 < (CH_3)_2NH$

(d) $CH_3NH_2 < (CH_3)_2NH < NH_3$

117. Nitrobenzene gives *N*-phenylhydroxylamine by

[AIIMS 2003]

(a) Sn/HCl

(b) $H_2/Pd - C$

(c) $Zn/NaOH$

(d) Zn/NH_4Cl

118. Among the following the weakest base is [AIIMS 2003]

(a) $C_6H_5CH_2NH_2$

(b) $C_6H_5CH_2NHCH_3$

(c) $O_2NCH_2NH_2$

(d) CH_3NHCHO

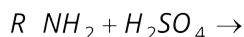
119. The correct order of basicity of amines in water is :

[Pb. CET 2003]

- (a) $(CH_3)_2NH > (CH_3)_3N > CH_3NH_2$
 (b) $CH_3NH_2 > (CH_3)_2NH > (CH_3)_3N$
 (c) $(CH_3)_3N > (CH_3)_2NH > CH_3NH_2$
 (d) $(CH_3)_3N > CH_3NH_2 > (CH_3)_2NH$

120. Complete the following reaction :

[MHCET 2004]



- (a) $[R-NH_3]^+ HSO_4^-$ (b) $[R-NH_3]_2^{2+} SO_4^{2-}$
 (c) $R-NH_2 \cdot H_2SO_4$ (d) No reaction

121. Which of the following compound reacts with chloroform and a base to form phenyl isocyanide ?

[MHCET 2003]

- (a) Phenol (b) Aniline
 (c) Benzene (d) Nitro benzene

122. Which one doesn't liberate NH_3 when undergoes hydrolysis

[Orissa JEE 2005]

- (a) Acetanilide (b) Acetonitrile
 (c) Acetamide (d) Phenyl isocyanide

123. A nitrogen containing organic compound gave an oily liquid on heating with bromine and potassium hydroxide solution. On shaking the product with acetic anhydride, an antipyretic drug was obtained. The reactions indicate that the starting compound is

[KCET 2004]

- (a) Aniline (b) Benzamide
 (c) Acetamide (d) Nitrobenzene

124. Benzamide on reaction with $POCl_3$ gives

[IIT-JEE 2004]

- (a) Aniline (b) Chlorobenzene
 (c) Benzyl amine (d) Benzonitrile

125. Among the following which one does not act as an intermediate in Hofmann rearrangement

[AIIMS 2005]

- (a) $RNCO$ (b) $RCO \ddot{N}$
 (c) $RCO \ddot{N} HBr$ (d) RNC

126. Aniline reacts with which of these to form Schiff base

[AFMC 2004]

- (a) Acetic acid (b) Benzaldehyde
 (c) Acetone (d) NH_3

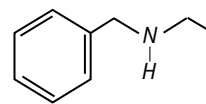
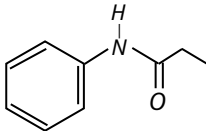
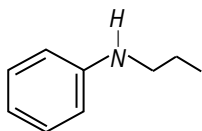
127. Which of the following does not reduce Tollen's reagent

[Kerala PMT 2004]

- (a) CH_3CHO (b) C_6H_5NHOH
 (c) $HCOOH$ (d) $C_6H_5NO_2$
 (e) None of these

128. Which one of the following compound is most basic ?

[UPSEAT 2004]



(A) (B) (C)

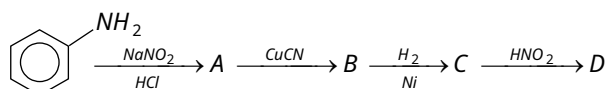
- (a) (A) (b) (B)
 (c) (C) (d) All are equally basic

129. Which one of the following methods is neither meant for the synthesis nor for separation of amines

[AIEEE 2005]

- (a) Hinsberg method (b) Hofmann method
 (c) Wurtz reaction (d) Curtius reaction

130. Aniline in a set of reactions yielded a product D.



The structure of product D would be

[CBSE PMT 2005]

- (a) $C_6H_5CH_2NH_2$ (b) $C_6H_5NHCH_2CH_3$
 (c) C_6H_5NHOH (d) $C_6H_5CH_2OH$

131. Electrolytic reduction of nitrobenzene in weakly acidic medium gives

[CBSE PMT 2005]

- (a) Aniline (b) Nitrosobenzene
 (c) N-Phenylhydroxylamine (d) p-Hydroxylaniline

132. Among the following compounds $C_3H_7NH_2$, NH_3 , CH_3NH_2 , $C_2H_5NH_2$ and $C_6H_5NH_2$, the least basic compound is

- (a) $C_3H_7NH_2$ (b) NH_3
 (c) CH_3NH_2 (d) $C_6H_5NH_2$
 (e) $C_2H_5NH_2$

133. The reduction of which of the following compound would yield secondary amine ?

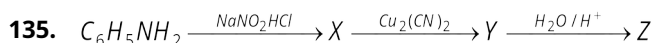
[DCE 2004]

- (a) Alkyl nitrite
 (b) Carbylamine
 (c) Primary amine
 (d) Secondary nitro compound

134. Azo dye is prepared by the coupling of phenol and :

[Pb. CET 2000]

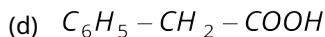
- (a) Diazonium chloride
 (b) o-nitro aniline
 (c) Benzoic acid
 (d) Chlorobenzene



Z is identified as :

[Pb. PMT 2004]

- (a) $C_6H_5-NH-CH_3$
 (b) C_6H_5-COOH
 (c) $C_6H_5-CH_2-NH_2$

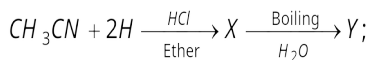


136. When acetamide reacts with Br_2 and caustic soda, then we get :

[CPMT 2004]

- (a) Acetic acid (b) Bromoacetic acid
(c) Methyl amine (d) Ethyl amine

137. In the reaction



the term Y is:

[BHU 2004]

- (a) Acetone (b) Ethyl amine
(c) Acetaldehyde (d) Dimethyl amine

138. Reaction of cyclohexanone with dimethylamine in the presence of catalytic amount of an acid forms a compounds if water during the reaction is continuously removed. The compound formed is generally known as [AIIEE 2005]

- (a) A Schiff's base (b) An enamine
(c) An imine (d) An amine

139. $R - NH - COH \xrightarrow[\text{pyridine}]{POCl_3} \text{product}$

In the given reaction what will be the product [BHU 2005]

- (a) $R - N = C = O$ (b) $R - \overset{+}{N} \equiv C^-$
(c) $R - C \equiv N$ (d) None of these.

140. Which of the following is secondary pollutant.

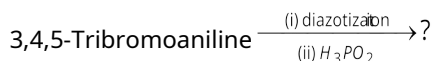
[BHU 2005]

- (a) CO_2 (b) N_2O
(c) PAN (d) SO_2

141. Nitration of aniline also gives *m*-nitro aniline, in strong acidic medium because [Kerala CET 2005]

- (a) In electrophilic substitution reaction amino group is meta directive
(b) In spite of substituents nitro group always goes to *m*- position
(c) In strong acidic medium, nitration of aniline is a nucleophilic substitution reaction
(d) In strong acidic medium aniline present as anilinium ion
(e) Strong acid, gives nitrate anion, which attacks at *m*-position

142. Identify the product in following order



[Kerala CET

2005]

- (a) 3, 4, 5 -Tribromobenzene
(b) 1, 2, 3 - Tribromobenzene
(c) 2, 4, 6 - Tribromobenzene
(d) 3, 4, 5 - Tribromo nitro benzene
(e) 3, 4, 5 - Tribromo phenol

143. The correct order of basicity in amines

- (i) $C_4H_5NH_2$ (ii) CH_3NH_2
(iii) $(CH_3)_2NH$ (iv) $(CH_3)_3N$

[Kerala CET 2005]

- (a) (i) < (iv) < (ii) < (iii) (b) (iv) < (iii) < (ii) < (i)
(c) (i) < (ii) < (iii) < (iv) (d) (ii) < (iii) < (iv) < (i)
(e) (iv) < (iii) < (ii) < (i)

Tests for Nitrogen Containing Compounds

1. When acetamide reacts with Br_2 and caustic soda, then we get

[DPMT 1983; BHU 1997; Orissa JEE 2002;
CPMT 1971, 78, 79, 81, 85, 2000, 03;
MP PMT 1989; MP PET 1995, 2002]

- (a) Acetic acid (b) Bromoacetic acid
(c) Methyl amine (d) Ethane

2. In organic compounds, nitrogen is tested in Lassaigne's test as

- (a) $NaNH_2$ (b) $NaCN$
(c) $NaNO_2$ (d) $NaNO_3$

3. Liebermann's nitroso reaction is used for testing

- (a) Primary amines (b) Secondary amines
(c) Tertiary amines (d) All the above

4. A nauseating smell in the carbylamine test for primary amines is due to the formation of [MP PET 1993]

- (a) Isocyanide (b) Chloroform
(c) Cyanide (d) DDT

5. A positive carbylamine test is given by [IIT-JEE 1999]

- (a) *N,N*-dimethylaniline
(b) 2, 4-dimethylaniline
(c) *N*-methyl-*o*-methylaniline
(d) *p*-methylbenzylamine

6. The colour of *p*-amino azobenzene is [BHU 1997]

- (a) Orange (b) Congo red
(c) Bismark brown (d) Indigo

7. When primary amine is heated with CS_2 in presence of excess mercuric chloride, it gives isothiocyanate. This reaction is called [KCET 1998; CPMT 1997]

- (a) Hofmann bromide reaction
(b) Hofmann mustard oil reaction
(c) Carbylamine reaction
(d) Perkin reaction

8. Diazo-coupling is useful to prepare some [CPMT 1999]

- (a) Dyes (b) Proteins
(c) Pesticides (d) Vitamins

9. Carbylamine test is used in the detection of [DCE 1999]

- (a) Aliphatic 2° amine
(b) Aromatic 1° amine
(c) Aliphatic 1° amine
(d) Both aliphatic and aromatic 1° amines
10. Which of the following substance does not give iodoform test
[BHU 2003]
- (a) C_6H_5CN (b) RNH_2
(c) CH_3OH (d) All
11. Which one of the following compounds when heated with KOH and a primary amine gives carbylamine test

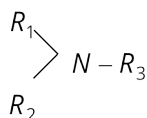
[Orissa JEE 2005]

- (a) $CHCl_3$ (b) CH_3Cl
(c) CH_3OH (d) CH_3CN

Critical Thinking

Objective Questions

1. The compound



forms nitroso amines when the substituents are

[Roorkee 1999]

- (a) $R_1 = CH_3, R_2 = R_3 = H$
(b) $R_1 = R_2 = H, R_3 = C_2H_5$
(c) $R_1 = H, R_2 = R_3 = CH_3$
(d) $R_1 = CH_3, R_2 = C_2H_5, R_3 = H$

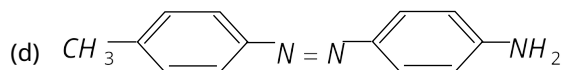
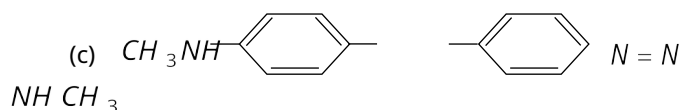
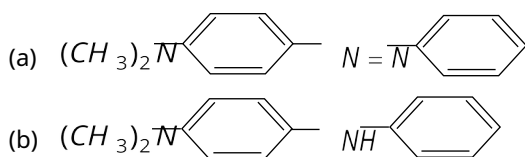
2. The action of nitrous acid on ethyl amine gives

[DPMT 1982; CPMT 1971, 89, 94;

MP PET 1993, 2001; RPMT 1997; Pb. PMT 1999]

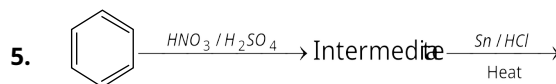
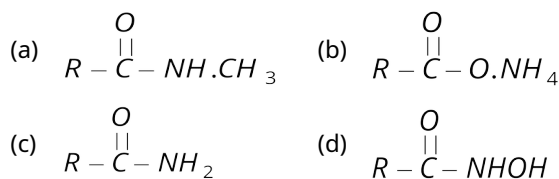
- (a) Ethane (b) Ammonia
(c) Ethyl alcohol (d) Nitroethane

3. Aniline when diazotized in cold and then treated with dimethyl aniline gives a coloured product. Its structure would be [CBSE PMT 2004]

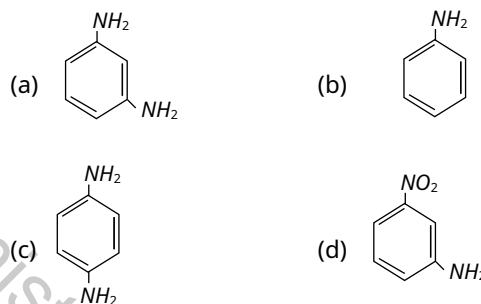


4. Indicate which nitrogen compound amongst the following would undergo Hofmann's reaction (i.e. reaction with Br_2 and strong KOH) to furnish the primary amine ($R-NH_2$)

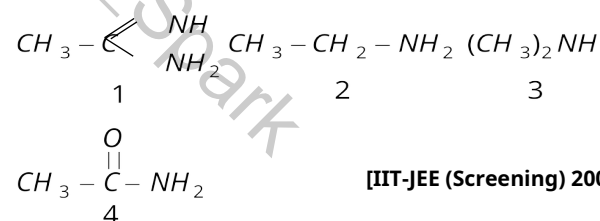
[CBSE PMT 1989]



[BHU 1995]



6. The correct order of basicities of the following compounds is



[IIT-JEE (Screening) 2001]

- (a) $2 > 1 > 3 > 4$ (b) $1 > 3 > 2 > 4$
(c) $3 > 1 > 2 > 4$ (d) $1 > 2 > 3 > 4$

7. Which of the following would be most reactive towards nitration [AMU 2000; UPSEAT 2002]

- (a) Benzene (b) Nitro benzene
(c) Toluene (d) Chloro benzene

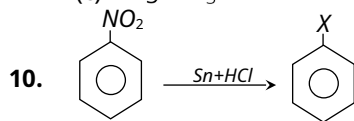
8. Aniline reacts with acetaldehyde to form

[MHCET 2004; AFMC 2004]

- (a) Schiff's base (b) Carbylamine
(c) Imine (d) None of these

9. *p*-chloroaniline and anilinium hydrochloride can be distinguished by [IIT-JEE 1998]

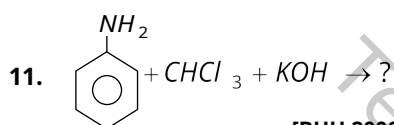
(a) Sandmeyer reaction (b) NaHCO_3
(c) AgNO_3 (d) Carbylamine test



In the above reaction 'X' stands for

[CPMT 1986, 2001; MP PET 1992; KCET (Engg./Med.) 2000]

(a) NH_2 (b) SnCl_2
(c) Cl (d) NH_4^+Cl^-



[BHU 2000; Pb. PMT 2000; Kerala 2003]

(a) Phenyl isocyanide (b) Benzyl amine
(c) Benzyl chloride (d) None of these

12. The order of basic strength among the following amines in benzene solution is [AIIMS 1991; RPMT 2002]

(a) $\text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N} > (\text{CH}_3)_2\text{NH}$
(b) $(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N}$
(c) $\text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH} > (\text{CH}_3)_3\text{N}$
(d) $(\text{CH}_3)_3\text{N} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH}$

13. The refluxing of $(\text{CH}_3)_2\text{NCOCH}_3$ with acid gives

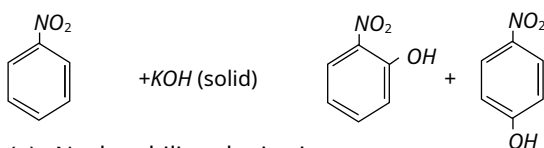
[KCET 1996]

(a) $2\text{CH}_3\text{NH}_2 + \text{CH}_3\text{COOH}$
(b) $2\text{CH}_3\text{OH} + \text{CH}_3\text{COOH}$
(c) $(\text{CH}_3)_2\text{NH} + \text{CH}_3\text{COOH}$
(d) $(\text{CH}_3)_2\text{NCOOH} + \text{CH}_4$

14. Order of basicity of ethyl amines is [MP PMT/PET 1988]

(a) Secondary > Primary > Tertiary
(b) Primary > Secondary > Tertiary
(c) Secondary > Tertiary > Primary
(d) Tertiary > Primary > Secondary

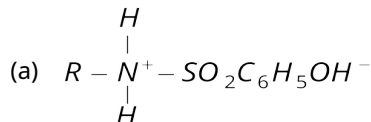
15. The following reaction is [KCET 1996]



(a) Nucleophilic substitution
(b) Electrophilic substitution
(c) Free radical substitution

(d) None of these

16. RNH_2 reacts with $\text{C}_6\text{H}_5\text{SO}_2\text{Cl}$ in aqueous KOH to give a clear solution. On acidification a precipitate is obtained which is due to the formation of [Roorkee 2000]



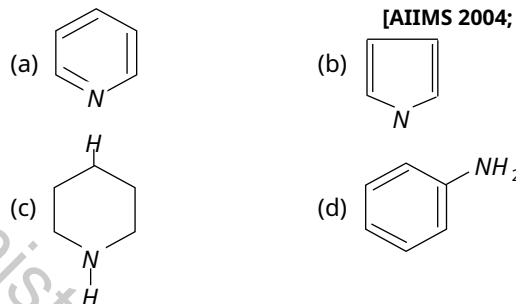
(b) $\text{R}-\text{N}^-\text{SO}_2\text{C}_6\text{H}_5\text{K}^+$
(c) $\text{R}-\text{NHSO}_2\text{C}_6\text{H}_5$
(d) $\text{C}_6\text{H}_5\text{SO}_2\text{NH}_2$

17. If N and S are present in an organic compound during Lassaigne test, then both changes into [CPMT 1997]

(a) Na_2S and NaCN
(b) NaSCN
(c) Na_2SO_3 and NaCN
(d) Na_2S and NaCNO

18. The strongest base among the following is

[AIIMS 2004; BHU 2004]



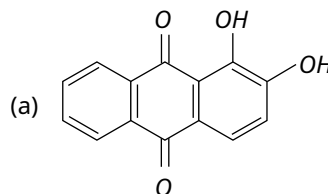
19. Nitroso amines ($\text{R}_2\text{N}-\text{N}=\text{O}$) are soluble in water. On heating them with concentrated H_2SO_4 they give secondary amines. The reaction is called [AFMC 1998; AIIMS 1998; BHU 2002]

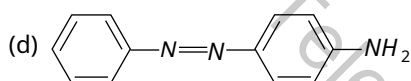
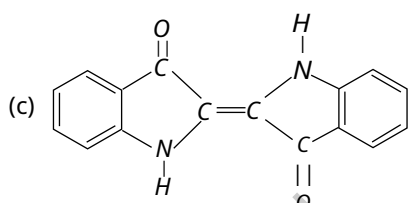
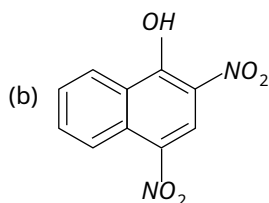
(a) Perkin's reaction
(b) Fittig's reaction
(c) Sandmeyer's reaction
(d) Liebermann's nitroso reaction

20. A primary amine is formed an amide by the treatment of bromine and alkali. The primary amine has : [BHU 2004]

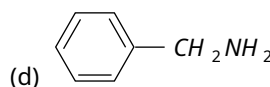
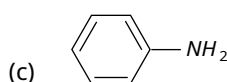
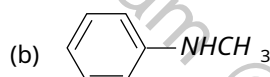
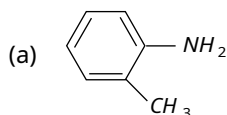
(a) 1 carbon atom less than amide
(b) 1 carbon atom more than amide
(c) 1 hydrogen atom less than amide
(d) 1 hydrogen atom more than amide

21. The structural formula of Indigo dye is : [DPMT 2004]

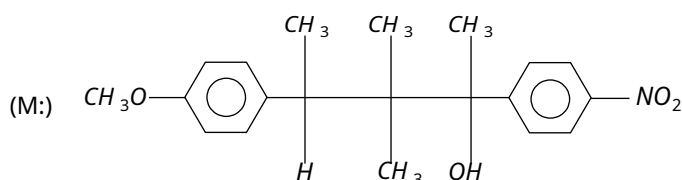
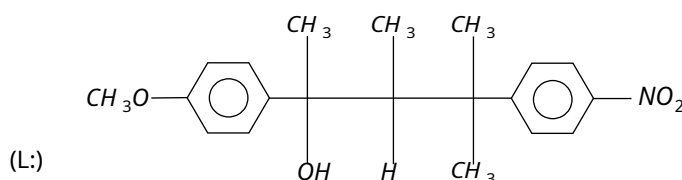
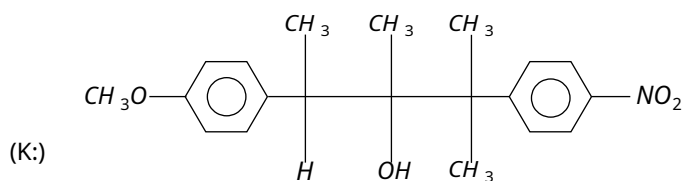
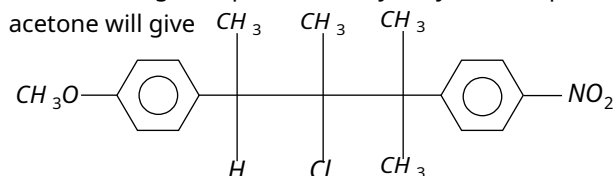




22. Which of the following is the strongest base ? [AIEEE 2004]



23. The following compound on hydrolysis in aqueous acetone will give



- (a) Mixture of (K) and (L) (b) Mixture of (K) and (M)
(c) Only (M) (d) Only (K)

Assertion & Reason

For AIIMS Aspirants

Read the assertion and reason carefully to mark the correct option out of the options given below :

- (a) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
(c) If assertion is true but reason is false.
(d) If the assertion and reason both are false.
(e) If assertion is false but reason is true.

1. Assertion : Benzene diazonium chloride does not give tests for nitrogen:

Reason : N_2 gas loss takes place during heating

[AIIMS 1999]

2. Assertion : Amines are basic in nature.

Reason : Presence of lone pair of electron on nitrogen atom. [AIIMS 1999]

3. Assertion : Methyl isocyanide reacts with ozone to form methyl isocyanate.

Reason : Methyl isocyanate was responsible for Bhopal tragedy.

4. Assertion : Alkyl cyanide can be prepared by carbylamine reaction

Reason : Ethyl amine when heated with chloroform in presence of alcoholic KOH, cyanide is formed.

5. Assertion : CN^- ion is an ambident nucleophile.

Reason : Nucleophiles are electron rich species.

6. Assertion : Sulphanilic acid exists as dipolar ion whereas *p*-aminobenzoic acid does not.

Reason : Carboxyl group being more acidic than $-SO_3H$ group can easily transfer a H^+ to the amino group.

7. Assertion : Nitrating mixture used for carrying out nitration of benzene consists of conc. HNO_3 + conc. H_2SO_4 .

- Reason : In presence of H_2SO_4 , HNO_3 acts as a base and produces NO_2^+ ions.
8. Assertion : In order to convert $R-Cl$ to pure $R-NH_2$, Gabriel phthalimide synthesis can be used.
- Reason : With proper choice of alkyl halides, phthalimide synthesis can be used to prepare 1° , 2° or 3° amines.
9. Assertion : Ammonolysis of alkyl halides involves the reaction between alkyl halides and alcoholic ammonia.
- Reason : Reaction can be used to prepare only 2° amines.
10. Assertion : Nitroalkanes, but not nitroarenes can be distilled at normal atmospheric pressure.
- Reason : Nitroalkanes are sparingly soluble in water while nitroarenes are insoluble.
11. Assertion : In Hofmann bromide reaction, the amine formed has one carbon atom less than the parent 1° amide.
- Reason : N -methyl acetamide undergoes Hofmann bromamide reaction.
12. Assertion : Nitrobenzene does not undergo Friedel Craft alkylation.
- Reason : Nitrobenzene is used as solvent in laboratory and industry.
13. Assertion : Ammonia is less basic than water.
- Reason : Nitrogen is less electronegative than oxygen.
14. Assertion : The reaction between a diazo salt and an aromatic amine or a phenol, giving an aminoazo or hydroxyazo compounds is called coupling reaction.
- Reason : Condensation of diazonium salt with phenol is carried out in weakly acidic medium.
15. Assertion : Carbylamine reaction involves the reaction between 1° amine and chloroform in basic medium.
- Reason : In carbylamine reaction, $-NH_2$ group is converted into $-NC$ group.
16. Assertion : Me_3N reacts with BF_3 whereas Ph_3N does not.
- Reason : The electron pair on nitrogen atom in Ph_3N is delocalised in the benzene ring and is not available to boron in BF_3 .
17. Assertion : p -Anisidine is weaker base than aniline.

Reason : $-OCH_3$ group in anisidine exerts $-R$ effect.

18. Assertion : Lower aldehydes and ketones are soluble in water but the solubility decreases as the molecular mass increases.

Reason : Distinction between aldehydes and ketones can be made by Tollen's test.

[AIIMS 1999]

19. Assertion : Aniline hydrogen sulphate on heating forms a mixture of ortho and para aminobenzene sulphonic acids.

Reason : The sulphonic acid group is electron withdrawing.

[AIIMS 1996]

20. Assertion : $p-O_2N-C_6H_5COCH_3$ is prepared by Friedel Crafts acylation of nitrobenzene.

Reason : Nitrobenzene easily undergoes electrophilic substitution reaction.

[AIIMS 2005]

21. Assertion : Alkyl isocyanides in acidified water give alkyl formamides.

Reason : In isocyanides, carbon first acts as a nucleophile and then as an electrophile.

[AIIMS 2005]

Answers

Introduction of Nitrogen Containing Compounds

1	a	2	c	3	a	4	d	5	c
6	d	7	c	8	d	9	c	10	a
11	a	12	b	13	b	14	a	15	b

Preparation of Nitrogen Containing Compounds

1	c	2	d	3	b	4	b	5	b
6	b	7	c	8	a	9	c	10	a
11	d	12	d	13	b	14	b	15	d
16	c	17	a	18	b	19	a	20	c
21	b	22	a	23	a	24	a	25	b
26	b	27	c	28	d	29	c	30	a
31	a	32	a	33	a	34	d	35	c
36	c	37	b	38	a	39	d	40	b,c
41	d	42	b	43	c	44	c	45	c

46	b	47	b	48	a	49	c	50	a
51	c	52	a	53	c	54	a	55	b

Properties of Nitrogen Containing Compounds

1	d	2	d	3	b	4	b	5	a
6	c	7	c	8	d	9	b	10	c
11	c	12	b	13	b	14	c	15	c
16	a	17	d	18	a	19	b	20	c
21	a	22	d	23	b	24	c	25	a
26	b	27	b	28	c	29	b	30	b
31	d	32	a	33	c	34	a	35	b
36	c	37	b	38	b	39	d	40	c
41	a	42	c	43	b	44	c	45	d
46	d	47	d	48	b	49	d	50	b
51	d	52	d	53	c	54	c	55	c
56	d	57	d	58	c	59	c	60	c
61	b	62	a	63	c	64	a	65	b
66	c	67	e	68	c	69	a	70	c
71	d	72	c	73	a	74	b	75	b
76	a	77	a	78	b	79	c	80	b
81	b	82	d	83	a	84	b	85	d
86	b	87	b	88	b	89	b	90	b
91	c	92	d	93	d	94	c	95	c
96	b	97	c	98	c	99	b	100	c
101	d	102	a	103	c	104	b	105	a
106	a	107	a	108	d	109	b	110	c
111	c	112	a	113	c	114	a	115	d
116	c	117	d	118	b	119	a	120	b
121	b	122	d	123	b	124	d	125	d
126	b	127	d	128	b	129	c	130	d
131	a	132	d	133	b	134	a	135	b
136	c	137	c	138	b	139	b	140	c
141	d	142	b	143	a				

Tests for Nitrogen Containing Compounds

1	c	2	b	3	b	4	a	5	b
6	a	7	b	8	a	9	d	10	d
11	a								

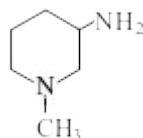
Critical Thinking Questions

1	c	2	c	3	a	4	c	5	b
6	b	7	b	8	a	9	bc	10	a
11	a	12	b	13	c	14	a	15	a
16	c	17	b	18	c	19	d	20	a
21	c	22	d	23	a				

EXERCISE-13

(MCQ OF NITROGEN COMPOUNDS)

Q.1 Compound is a



- (1) 1° and 3° amine
- (2) Only primary amine
- (2) 2° and 3° amine
- (4) Only secondary amine

Q.2 The third member of homologous series of dimethyl amine -

- (1) $\text{CH}_3\text{-CH}_2\text{-NH-CH}_2\text{-CH}_3$
- (2) $\text{CH}_3\text{-NH-CH}_2\text{-CH}_2\text{-CH}_3$
- (3) $\text{CH}_3\text{-NH-CH(CH}_3)_2$

(4) (2) and (3) are correct

Q.3 Tertiary butyl amine is a-

- (1) 1° Amine
- (2) 2° Amine
- (3) 3° Amine
- (4) Quaternary salt

Q.4 Aliphatic amines are basic than NH_3 , but aromatic amines are basic than NH_3 -

- (1) More, less
- (2) Less, more
- (3) Both (1) and (2)
- (4) None of these

Q.5 Suitable explanation for the order of basic character $(\text{CH}_3)_3\text{N} < (\text{CH}_3)_2\text{NH}$ is -

- (1) Steric hindrance by bulky methyl group
- (2) Higher volatility of 3° amine
- (3) Decreased capacity for H-bond formation with H_2O
- (4) Decreased electron-density at N atom

Q.6 The basic character of amines can be explained -

- (1) In terms of Lewis and Arrhenius concept
- (2) In terms of Lowry and Bronsted concept
- (3) In terms of Lewis and Lowry Bronsted concept
- (4) Only by Lewis concept

Q.7 The number of π bonds present in CN-CH=CH-CN -

- (1) 5
- (2) 4
- (3) 3
- (4) 2

Q.8 Hinsberg's reagent is -

- (1) Diethyl oxalate
- (2) Benzyl chloride
- (3) Benzene sulphonyl chloride
- (4) None of these

Q.9 Hydrolysis of alkyl isocyanide yields -

- (1) Primary amine
- (2) Tert. amine
- (3) Alcohol
- (4) Aldehyde

Q.10 How many isomeric amines can have the formula $\text{C}_4\text{H}_{11}\text{N}$ -

- (1) Five
- (2) Six
- (3) Seven
- (4) Eight

Q.11 $\text{C}_2\text{H}_5\text{NH}_2$ cannot be prepared by the reduction of -

- (1) $\text{C}_2\text{H}_5\text{NO}_2$
- (2) $\text{CH}_3\text{CH=NOH}$
- (3) $\text{C}_2\text{H}_5\text{NC}$
- (4) CH_3CN

Q.12 A mixture of 1°, 2° and 3° amine is formed in the reaction -

- (1) 1° Amine + caustic potash + bromine
- (2) Methyl halide and ammonia
- (3) Cyclic imide + H_3O^+
- (4) Alkyl isocyanide + H_2

Q.13 The presence of primary amines can be confirmed by -

- (1) Reaction with HNO_2
- (2) Reaction with CHCl_3 and alc. KOH
- (3) Reaction with Grignard reagent
- (4) Reaction with acetyl chloride

Q.14 Ethylamine can be prepared by the all except -

- (1) Curtius reaction
- (2) Hofmann reaction
- (3) Mendius reaction
- (4) Reduction of formaldoxime

Q.15 Ammonolysis of alcohol, i.e. - $x\text{CH}_3\text{OH} + y\text{NH}_3$ Products

- (1) CH_3NH_2
- (2) $(\text{CH}_3)_2\text{NH}_2$
- (3) $(\text{CH}_3)_3\text{N}$
- (4) A mixture of amines

Q.16 The compound obtained by the reaction between primary amine and aldehyde is -

- (1) An amide
- (2) Imine
- (3) Nitrite
- (4) Nitro

Q.17 Which one of the following behaves both as nucleophile and as an electrophile ?

- (1) $\text{CH}_3\text{C}\equiv\text{N}$
- (2) $\text{CH}_3\text{-OH}$
- (3) $\text{H}_2\text{C=CH-CH}_3$
- (4) $\text{CH}_3\text{-NH}_3$

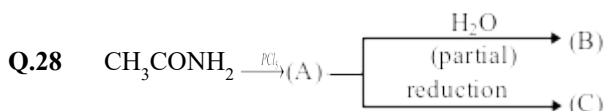
- Q.18** A primary nitroalkane is treated with nitrous acid, which of the following will be the main product :
 (1) pseudonitrol (2) nitrolic acid
 (3) a primary amine (4) a primary alcohol
- Q.19** Acetonitrile has the structure :
 (1) C_2H_5NC (2) C_2H_5CN
 (3) CH_3NC (4) CH_3CN
- Q.20** Which of the following method is generally not employed for the separation of primary, secondary and tertiary amines ?
 (1) fractional distillation
 (2) Hinsberg's method
 (3) Hofmann's method
 (4) Filtration
- Q.21** How many primary amines are possible for the formula $C_4H_{11}N$?
 (1) 1 (2) 2 (3) 3
 (4) 4
- Q.22** $CH_3NH_2 + CHCl_3 + 3KOH \rightarrow X + Y + 3H_2O$;
 compounds X and Y are -
 (1) $CH_3CN + 3KCl$
 (2) $CH_3NC + 3KCl$
 (3) $CH_3CONH_2 + 3KCl$
 (4) $CH_3NC + K_2CO_3$
- Q.23** $HCONHR \xrightarrow[\Delta]{POCl_3} (\text{product}) + H_2O$:
 (product) in the above reaction is -
 (1) $RCH=NOH$ (2) $R-N=C=O$
 (3) $R-C \equiv N$ (4) $R-\overset{\oplus}{N} \equiv \overset{\ominus}{C}$
- Q.24** $-CONH_2 \xrightarrow{\text{Reduction}} -CH_2NH_2$
 In above reaction hybridisation state of carbon changes from \rightarrow
 (1) $sp \rightarrow sp^2$ (2) $sp \rightarrow sp^3$
 (3) $sp^2 \rightarrow sp^3$ (4) $sp^2 \rightarrow sp$
- Q.25** Mendius reaction involves the reduction of -
 (1) Cyanoalkanes (2) Alkyl isocyanides
 (3) Oximes (4) Nitroalkanes
- Q.26** A reaction used in descending a homologous series would be -

- (1) $RCONH_2 + Br_2 + KOH$
 (2) $RCH_2Cl + KCN$
 (3) $RNH_2 + CHCl_3 + KOH$
 (4) None of the above



C and D in the sequence are -

- (1) Benzoic acid + aniline
 (2) Phthalic acid + ethylamine
 (3) Phthalic acid + aniline
 (4) Benzoic acid + ethylamine



The functional groups of (B) and (C) respectively are-

- (1) $\begin{array}{c} \text{C} \\ \parallel \\ \text{O} \end{array} - NH_2, -NH_2$ (2) $\begin{array}{c} \text{C} \\ \parallel \\ \text{O} \end{array} - NH_2, -COOH$
 (3) $-CN, -NH-$ (4) $\begin{array}{c} \text{C} \\ \parallel \\ \text{O} \end{array} - OH, -\overset{\oplus}{N}-$

- Q.29** On reduction of Schiff's base we get -
 (1) Primary amine (2) Secondary amine
 (3) Anils (4) Anilide

- Q.30** Alkyl halide reacts with $AgCN$ to form -
 (1) Alcohol (2) Cyanide
 (3) Isocyanide (4) Both (2) and (3)

- Q.31** Amide on heating with P_2O_5 gives -
 (1) Alkane nitrile (2) Alkyl halide
 (3) Amine (4) None of these

- Q.32** Grignard reagent reacts with cyanogen chloride to form -
 (1) Alkane nitrile (2) Alkyl halide
 (3) Amine (4) None of these

- Q.33** The IUPAC name of CH_3NC is -
 (1) Methyl isocyanide
 (2) Methyl isonitrile
 (3) Methylcarbylamine
 (4) Carbylamino methane

Q.34 Ethyl iodide on reaction with potassium nitrite gives -

- (1) Ethyl nitrite (2) Nitro ethane
(3) Amine (4) Acid

Q.35 Which of the following is optically active amine-

- (1) CH_3NH_2
(2) CH_3NHCH_3
(3) $\text{CH}_3\text{CH}_2\text{CH}_2\text{N}(\text{CH}_3)\text{C}_2\text{H}_5$
(4) $\text{CH}_3-\underset{\text{NH}_2}{\underset{|}{\text{CH}}}-\text{CH}_2-\text{CH}_3$

Q.36 Which of the following would undergo Hoffmann bromide reaction to form primary amine-

- (1) RCONHCH_3 (2) RCOONH_4
(3) RCONH_2 (4) RCONHOH

Q.37 Which of the following will give primary amine on hydrolysis -

- (1) Nitroparaffins
(2) Alkyl cyanide
(3) Oxime
(4) Alkyl isocyanide

Q.38 The alkanenitriles are isomeric with-

- (1) Primary alkanamines
(2) Secondary alkanamines
(3) Alkyl isocyanides
(4) Nitroalkanes

Q.39 Which of the following is obtained by reducing methyl cyanide with $\text{Na} + \text{C}_2\text{H}_5\text{OH}$ -

- (1) Methyl alcohol (2) Acetic acid
(3) Ethyl amine (4) Methane

Q.40 Ethylamine can be prepared by the all except -

- (1) Curtius reaction
(2) Hoffmann reaction
(3) Mendius reaction
(4) Reduction of formaldoxime

Q.41 Which of the following compounds possesses a chiral nitrogen atom ?

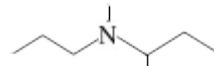
- (1) $\text{CH}_3\text{CH}_2\underset{\text{NH}_3}{\underset{|}{\text{CH}}}\text{CH}_3$

(2) $\text{CH}_3\text{CH}_2\text{NHCH}_2\text{CH}_3$

(3) $\text{CH}_3\text{CH}_2\text{CH}_2\underset{\text{CH}_3}{\underset{|}{\text{N}}}\text{CH}_2\text{CH}_3$

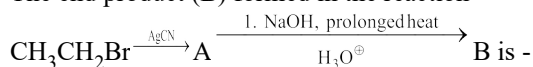
(4) $\text{CH}_3\text{CH}_2\underset{\text{CH}_3}{\underset{|}{\text{N}}}\text{CH}_2\text{CH}_3$

Q.42 The IUPAC name of the following compound is -



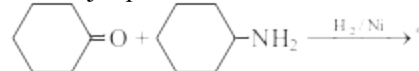
- (1) N, 3-dimethyl-N-propyl-3-propanamine
(2) N-methyl-N-propyl-2-butanamine
(3) s-butylmethyl-n-propylamine
(4) N, 1-dimethyl-N-propyl-propanamine

Q.43 The end product (B) formed in the reaction



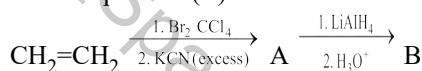
- (1) $\text{CH}_3\text{CH}_2\text{NHCH}_3$ (2) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$
(3) $\text{CH}_3\text{CH}_2\text{NH}_2$ (4) $\text{CH}_3\text{CH}_2\text{NHCOH}$

Q.44 The major product formed in the reaction is -



- (1)
(2)
(3)
(4)

Q.45 The end product (B) formed in the reaction

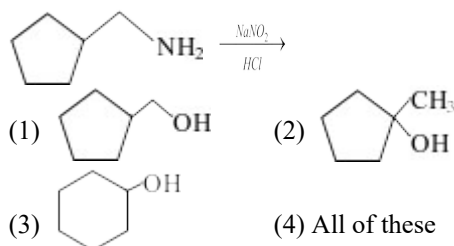


- (1) $\text{CH}_2=\text{CHCH}_2\text{NH}_2$
(2) $\text{H}_2\text{N}(\text{CH}_2)_4\text{NH}_2$
(3) $\text{CH}_3\text{NH}(\text{CH}_2)_2\text{NHCH}_3$
(4) $\text{NC}(\text{CH}_2)_2\text{CN}$

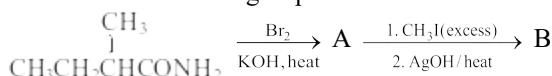
Q.46 Among the following compounds which one will produce a Schiff base on reaction with cyclohexanone ?

- (1)
(2)
(3)
(4)

Q.47 The possible product formed in the reaction



Q.48 Consider the following sequence of reactions



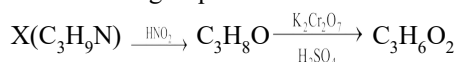
The major product (B) is -

- (1) $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$
 (2)
 (3) $\text{CH}_3\text{CH}=\text{CHCH}_3$
 (4)

Q.49 A compound (X) having the molecular formula $\text{C}_3\text{H}_9\text{N}$ reacts with benzenesulphonyl chloride to form a solid that is insoluble in alkalis. The compound (X) is -

- (1) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$ (2) $(\text{CH}_3)_2\text{CHNH}_2$
 (3) $\text{CH}_3\text{CH}_2\text{NHCH}_3$ (4) $(\text{CH}_3)_3\text{N}$

Q.50 Consider the following sequence of reactions



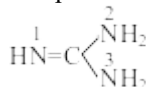
The compound (X) is -

- (1) $\text{CH}_3\text{CH}_2\text{NHCH}_3$ (2) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$
 (3) $(\text{CH}_3)_2\text{CHNH}_2$ (4) $(\text{CH}_3)_3\text{N}$

Q.51 The product (A) and (B) of the reaction $\text{CH}_3\text{CH}_2\text{NH}_2 + \text{CH}_3\text{MgBr} \rightarrow \text{A} + \text{B}$ are -

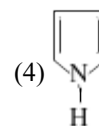
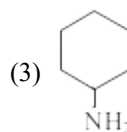
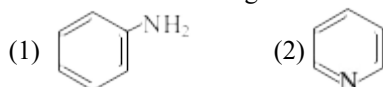
- (1) $\text{CH}_3\text{CH}_2\text{CH}_3$ and NH_2MgBr
 (2) $\text{CH}_3\text{CH}_2\text{NHCH}_3$ and MgBr_2
 (3) $\text{CH}_3\text{CH}_2\text{N}(\text{CH}_3)_2$ and MgBr_2
 (4) $\text{CH}_3\text{CH}_2\text{NHMgBr}$ and CH_4

Q.52 Which nitrogen is protonated readily in guanidine



- (1) 1 (2) 2
 (3) 3 (4) All of these

Q.53 Which of the following is most basic ?



Q.54 In carbylamine reaction :

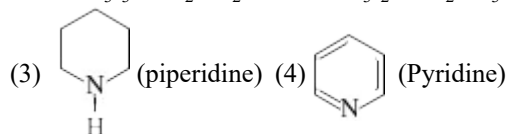
- (1) the nucleophile is a RNH_2 and electrophile is : CCl_2
 (2) the nucleophile is primary amine and electrophile is CCl_3^-
 (3) the nucleophile is : CCl_2 and the electrophile is primary amine
 (4) the attacking reagent is electrophile

Q.55 Which one of the following will not react with the Grignard reagent ($\text{C}_2\text{H}_5\text{MgBr}$) ?

- (1) $\text{C}_2\text{H}_5-\text{NH}_2$ (2)
 (3) (4) $\text{CH}_3-\text{C}(=\text{O})-\text{NH}_2$

Q.56 One mole of an amine (A) consumes two moles of methyl bromide to give a quaternary ammonium salt. The amine (A) is -

- (A) $(\text{CH}_3)_3\text{CCH}_2\text{NH}_2$ (B) $(\text{CH}_3)_2\text{NCH}_2\text{CH}_3$



Q.57 (A) $\xrightarrow{\text{H}_2/\text{Pt}}$ 1° Amine
(B) $\xrightarrow{\text{H}_2/\text{Pt}}$ 2° Amine :

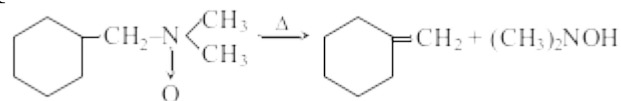
(A) and (B) respectively are -

- (1) RNC , RNC (2) RCN , RCN
 (3) RCN , RNC (4) RNC , RCN

Q.58 $\text{CH}_3\text{CH}_2\text{NH}_2$ contains a basic NH_2 group, but CH_3CONH_2 does not, because :

- (1) Acetamide is amphoteric in character
 (2) In $\text{CH}_3\text{CH}_2\text{NH}_2$ the electron pair on N-atom is delocalised by resonance
 (3) In $\text{CH}_3\text{CH}_2\text{NH}_2$ there is no resonance, while in acetamide the lone pair of electrons on N-atom is delocalised and therefore less available for protonation
 (4) None of these

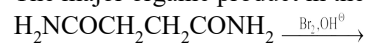
Q.59 The reaction



is called -

- (1) Cope reaction (2) Ritter reaction
 (3) Schmidt reaction (4) Gabriel's reaction

Q.60 The major organic product in the reaction is



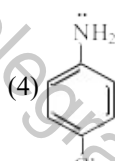
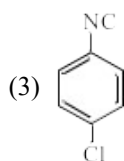
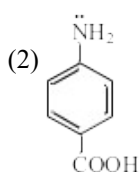
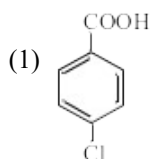
- (1) $\text{H}_2\text{NCO}(\text{CH}_2)_3\text{NH}_2$
- (2) $\text{BrNH}-\text{CO}-(\text{CH}_2)_3-\text{CO}-\text{NH}_2$
- (3) $\text{BrNH}-\text{CO}-(\text{CH}_2)_3-\text{CO}-\text{NHBr}$
- (4) $\text{H}_2\text{N}(\text{CH}_2)_2\text{NH}_2$

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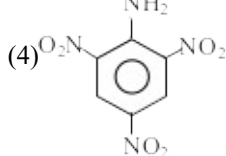
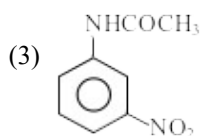
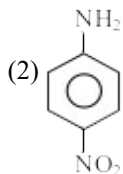
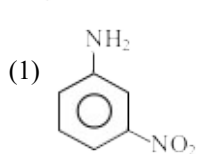
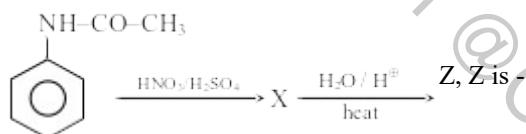
EXERCISE-14

(BRAIN TWISTERS OF NITROGEN COMPOUNDS)

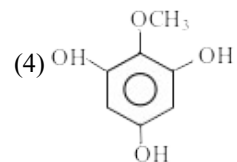
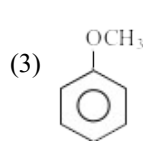
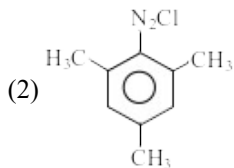
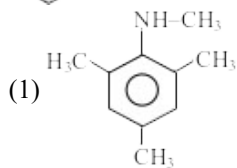
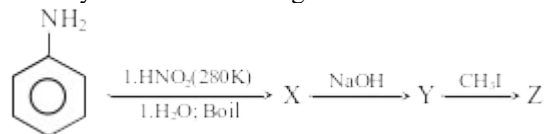
Q.1 Identify X in the reaction



Q.2



Q.3 Identify 'Z' in the reaction given below -



Q.4

Of the following statements -

- (P) $C_6H_5N=CH-C_6H_5$ is a Schiff's base
- (Q) A dye is obtained by the reaction of aniline and $C_6H_5N=NCl$
- (R) $C_6H_5CH_2NH_2$ on treatment with $[NaNO_2 + HCl]$ gives diazonium salt
- (S) p-Toluidine on treatment with $[HNO_2 + HCl]$ gives diazonium salt
- (1) Only (P) and (Q) are correct
- (2) Only (P) and (R) are correct
- (3) Only (R) and (S) are correct
- (4) (P), (Q) and (S) are correct

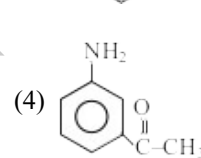
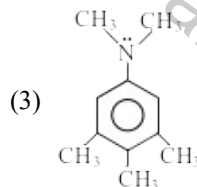
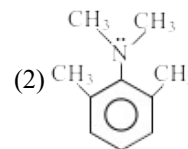
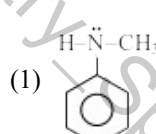
Q.5

Choose the false statement -

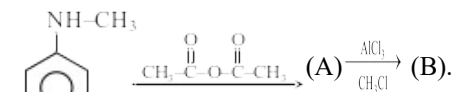
- (1) $-NH_2$ is strongly activating while $-NHCOCH_3$ is activating
- (2) $-NO_2$ is strongly deactivating while $-CHO$ is deactivating
- (3) $-NH-\overset{C}{\parallel}-R$ and $-CH=O$ are m-directing groups
- (4) $-CF_3$ and $-\overset{C}{\parallel}-R$ are m-directing groups

Q.6

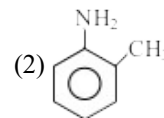
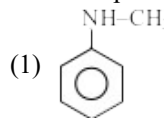
Which of the following is most basic -

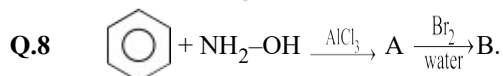
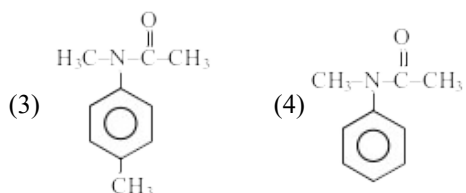


Q.7

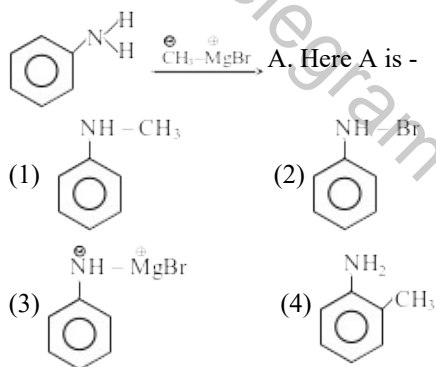
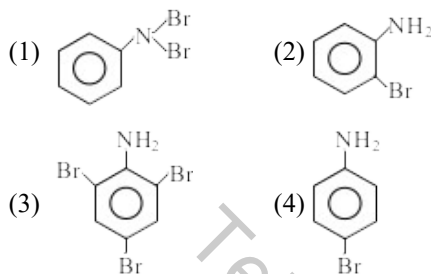


Here end product (B) is -

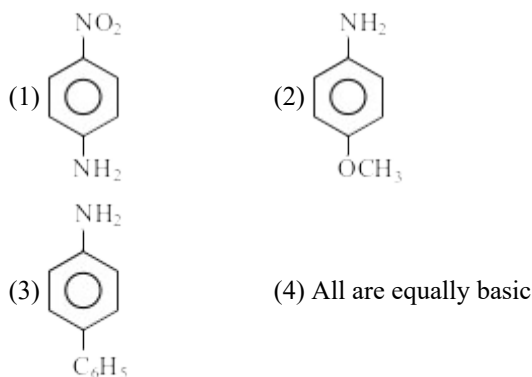




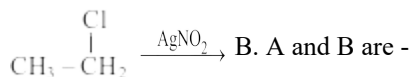
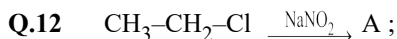
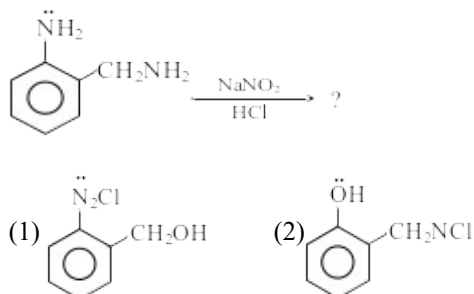
Here end product (B) is -



Q.10 Which of the following is least alkaline -



Q.11

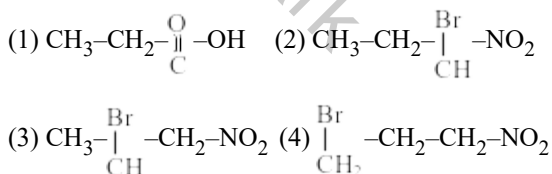
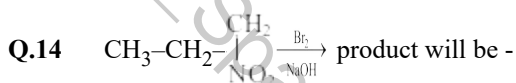


- (1) $\text{CH}_3\text{-CH}_2\text{-NO}_2$, $\text{CH}_3\text{-CH}_2\text{-O-N=O}$
 (2) $\text{CH}_3\text{-CH}_2\text{-O-N=O}$, $\text{CH}_3\text{-CH}_2\text{-NO}_2$
 (3) Both are $\text{CH}_3\text{-CH}_2\text{-NO}_2$
 (4) Both are

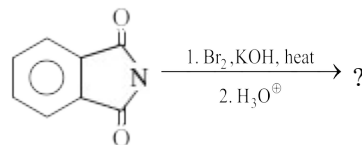
Q.13 Name the products in the acid- base reaction -

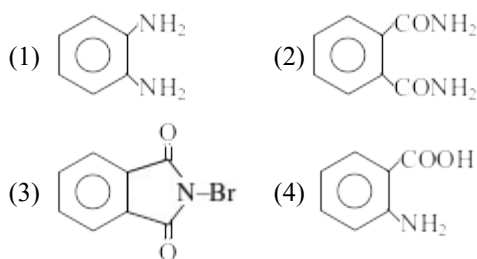


- (1) (A) Trimethyl ammonium iodide
 (B) Trimethyl ammonium bromide
 (2) (A) Ethyl ammonium iodide
 (B) Methyl ammonium bromide
 (3) (A) Ethyl ammonium iodide
 (B) Trimethyl ammonium bromide
 (4) All of these

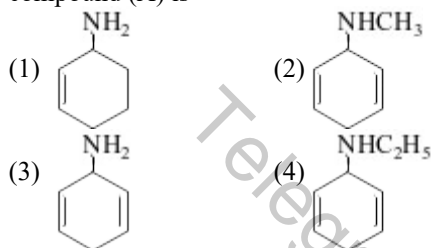


Q.15 The product formed in the reaction is -

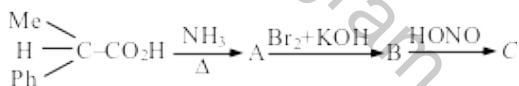




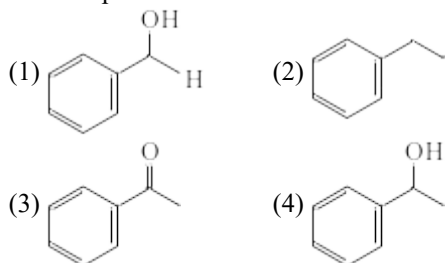
Q.16 An optically active compound (A) decolourises Br_2/CCl_4 and releases N_2 with nitrous acid. The compound (A) is -



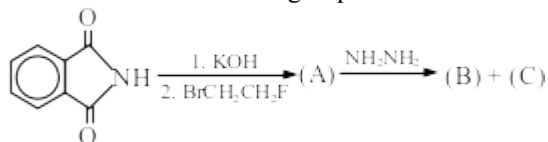
Q.17



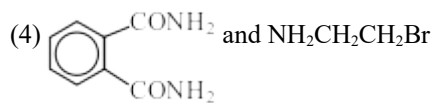
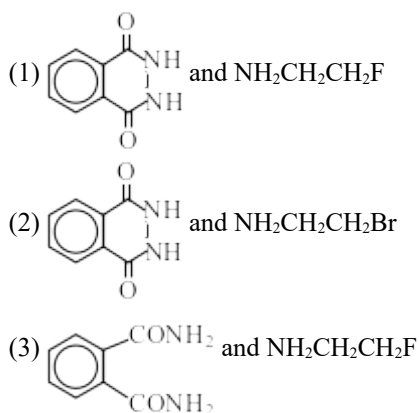
The end product C is



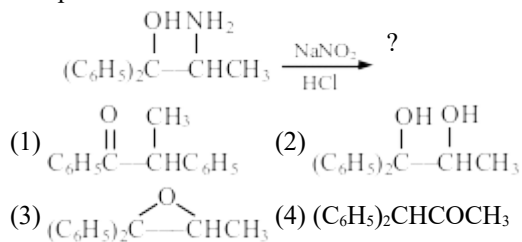
Q.18 Consider the following sequence of reactions.



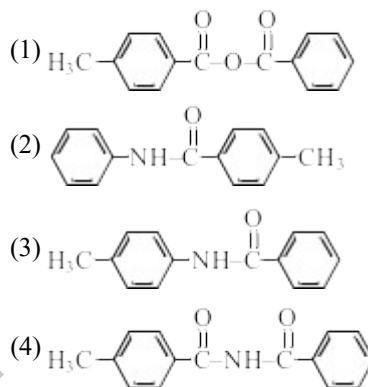
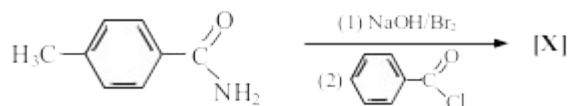
The products (B) and (C) are -



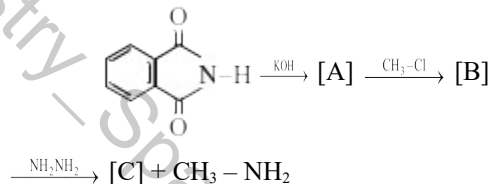
Q.19 The product of the reaction is -



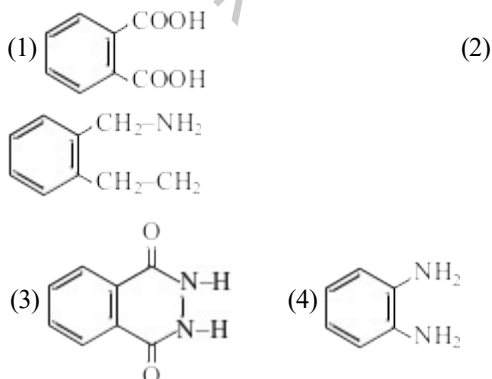
Q.20 In the reaction the structure of the product [X] is



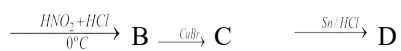
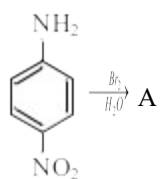
Q.21



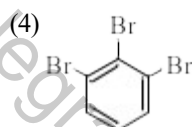
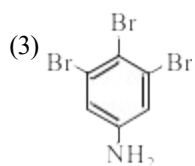
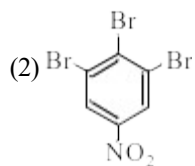
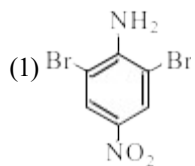
What is the compound [C] ?



Q.22



What is the end product D ?






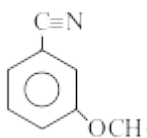
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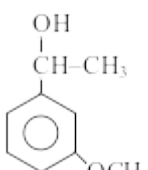
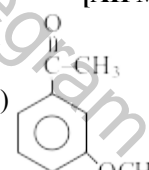
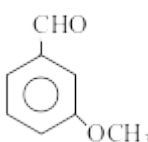
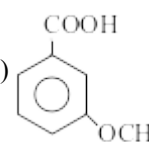
EXERCISE-15 A

(AIPMT & AIIMS QUESTIONS)

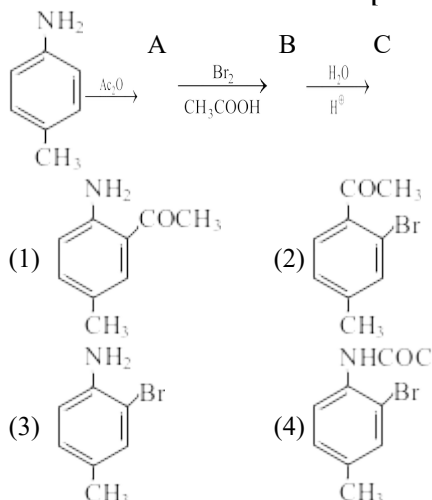
Q.1 $A \xrightarrow{\text{reduction}} B \xrightarrow{\text{CHCl}_3/\text{KOH}} C \xrightarrow{\text{reduction}} \text{N-methyl aniline}$ than A is -
[AIPMT-2000]

- (1)  (2) 
(3) CH_3NH_2 (4) 

Q.2  + $\text{CH}_3\text{MgBr} \xrightarrow{\text{H}_3\text{O}^+}$ product is -
[AIPMT-2002]

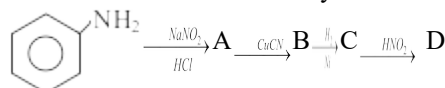
- (1)  (2) 
(3)  (4) 

Q.3 The final product C, obtained in this reaction would be
[AIPMT-2003]



Q.4 Electrolytic reduction of nitrobenzene in weakly acidic medium gives
[AIPMT-2005]
(1) Aniline
(2) p-Hydroxy aniline
(3) N-Phenyl hydroxyl amine

(4) Nitroso benzene
Q.5 Aniline in a set of reactions yields a end product



The product D would be - [AIPMT-2005]

- (1) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ (2) $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$
(3) $\text{C}_6\text{H}_5\text{NHOH}$ (4) $\text{C}_6\text{H}_5\text{NHCH}_2\text{CH}_3$

Q.6 Nitrobenzene gives N-phenyl hydroxyl amine by -
[AIIMS-2003]

- (1) Sn/HCl (2) $\text{H}_2/\text{Pd}-\text{C}$
(3) Zn/NaOH (4) $\text{Zn}/\text{NH}_4\text{Cl}$

Q.7 Aromatic nitriles (ArCN) are not prepared by reaction -
[AIIMS-2004]

- (1) $\text{ArX} + \text{KCN}$ (2) $\text{ArN}_2^+ + \text{CuCN}$
(3) $\text{ArCONH}_2 + \text{P}_2\text{O}_5$ (4) $\text{ArCONH}_2 + \text{SOCl}_2$

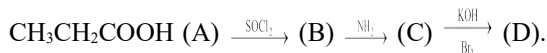
Q.8 Melting points are normally the highest for -
[AIIMS-2004]

- (1) Tertiary amides (2) Secondary amides
(3) Primary amides (4) Amines

Q.9 Among the following which one does not act an intermediate in Hoffmann rearrangement -
[AIIMS-2005]

- (1) RNCO (2) $\text{RCO}\ddot{\text{N}}^-$
(3) $\text{RCO}\ddot{\text{N}}\text{HBr}$ (4) RNC

Q.10 In a set of reactions propionic acid yielded a compound (D);
[AIPMT-2006]



What is the structure of (D)

- (1) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$ (2) $\text{CH}_3\text{CH}_2\text{CONH}_2$
(3) $\text{CH}_3\text{CH}_2\text{NHCH}_3$ (4) $\text{CH}_3\text{CH}_2\text{NH}_2$

Q.11 Which one of the following on reduction with LiAlH_4 yields a secondary amine [AIPMT-2007]

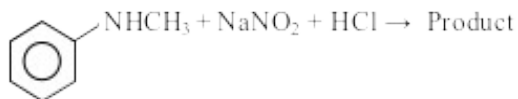
- (1) Methyl isocyanide (2) Acetamide
(3) Methyl cyanide (4) Nitro ethane

Q.12 Nitrobenzene can be prepared from benzene by using a mixture of conc. HNO_3 and

conc. H_2SO_4 . In the mixture, nitric acid acts as a/an - [AIPMT-2009]

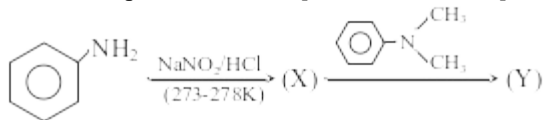
- (1) catalyst
- (2) reducing agent
- (3) acid
- (4) base

Q.13 Predict the product : [AIPMT-2009]



- (1)
- (2)
- (3)
- (4)

Q.14 Aniline in a set of the following reactions yielded a coloured product 'Y'. [AIPMT-04,08,10]



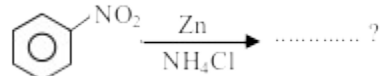
The structure (Y) would be -

- (1)
- (2)
- (3)
- (4)

Q.15 Which of the following statements about primary amines is 'False' ? [AIPMT-2010]

- (1) Alkyl amines are stronger bases than aryl amines
- (2) Alkyl amines react with nitrous acid to produce alcohols
- (3) Aryl amines react with nitrous acid to produce phenols
- (4) Alkyl amines are stronger bases than ammonia

Q.16 What is the product obtained in the following reaction : [AIPMT-2011]



- (1)
- (2)
- (3)
- (4)

Q.17 Which of the following compounds is most basic ? [AIPMT MAINS-2015]

- (1)
- (2)
- (3)
- (4)

Q.18 An organic compound 'A' on treatment with NH_3 gives 'B', which on heating gives 'C'. 'C' when treated with Br_2 in the presence of KOH produces ethylamine. Compound 'A' is -

- (1) $\text{CH}_3\text{CH}_2\text{COOH}$ [AIPMT MAINS-2016]
- (2) CH_3COOH
- (3) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$
- (4)

EXERCISE-15B

(OTHER EXAM QUESTIONS)

- Q.1** After nitration of benzene, reaction with (Sn + HCl) the end product will be - [RPMT-2000]
 (1) $C_6H_5NH_2$ (2) $C_6H_5NO_2$
 (3) C_6H_5OH (4) $C_6H_5-N \begin{array}{c} \uparrow O \\ \uparrow -O \\ N \end{array}$
- Q.2** When aniline heated with benzaldehyde, then product is - [RPMT-2000]
 (1) Benzene (2) Azoxy benzene
 (3) Schiff base (4) Unsaturated acid
- Q.3** Which of following exist as zwitter ion - [RPMT-2002]
 (1) Ammonium acetate
 (2) Ethyl acetate
 (3) Glycine
 (4) Aniline hydro chloride
- Q.4** In the sequence of the following reaction
 $CH_3OH \xrightarrow{III} CH_3I \xrightarrow{KCN} CH_3CN$
 $\xrightarrow{\text{reduction}} X \xrightarrow{HNO_2} Y$;
 X and Y respectively are - [MP PMT-2002]
 (1) $CH_3CH_2NH_2$ and CH_3CH_2OH
 (2) $CH_3CH_2NH_2$ and CH_3COOH
 (3) CH_3CH_2OH and CH_3CHO
 (4) CH_3OCH_3 and CH_3CHO
- Q.5** Reduction of methyl isocyanide gives - [MP PMT-2002]
 (1) Ethyl amine (2) Methyl amine
 (3) Dimethylamine (4) Trimethyl amine
- Q.6** Which of the following compound on treatment with $NaNO_2$ and HCl gives alcohol and N_2 gas - [RPMT-2003]
 (1) Benzene (2) C_2H_5Cl
 (3) $CH_3CH_2NH_2$ (4) $C_2H_5NO_2$
- Q.7** What is the 'X' in given reaction
 $NH_2-CH_2-COOH \xrightarrow{Ba(OH)_2} X$ [RPMT-2003]
 (1) CH_3NH_2 (2) CH_3COOH
 (3) CH_3NO_2 (4) NH_2CH_2CHO
- Q.8** On slowly heating urea gives [RPMT-2003]
 (1) $NH_3 + CO_2$ (2) $NH_3 + CO$
- (3) $O=C \begin{array}{c} \diagup OH \\ \diagdown OH \end{array}$ (4) Biuret
- Q.9** $CH_3CH_2-NH_2 \xrightarrow{O} X \xrightarrow{H_2O} CH_3CHO$. What is 'X' [RPMT-2003]
 (1) CH_3CH_2OH (2) CH_3COOH
 (3) $CH_3-CH=NH$ (4) $CH_3-CH_2-NO_2$
- Q.10** Ethyl amine react with $CHCl_3$ in presence of NaOH to gives offensive smell. The compound obtained is - [RPMT-2003]
 (1) C_2H_5Cl (2) C_2H_5CN
 (3) C_2H_5NC (4) $CH_3-CH=NH$
- Q.11** $CH_3CH_2NH_2 \xrightarrow{NaNO_2/HCl} ?$
 The product of the above reaction is - [RPMT-2003]
 (1) CH_3CH_2OH (2) CH_3CHO
 (3) CH_3-CH_3 (4) CH_3COCH_3
- Q.12** Hinsberg reagent is used to distinguish between - [RPMT-2004]
 (1) 1° amine and 2° amine
 (2) 2° amine and 3° amine
 (3) 1° amine and 3° amine
 (4) All the above
- Q.13** Which reaction does not give primary amine [RPMT-2004]
 (1) $CH_3CONH_2 \xrightarrow{Br_2/KOH}$
 (2) $CH_3-C \equiv N \xrightarrow{LiAlH_4}$
 (3) $CH_3-N \equiv C \xrightarrow{LiAlH_4}$
 (4) None of these
- Q.14** Gabriel phthalimide reaction is used to prepare - [RPMT-2005]
 (1) Amine (2) Alcohol
 (3) Aldehyde (4) Acid
- Q.15** Biuret test used for - [RPMT-2005]
 (1) Urea (2) Amine
 (3) Nitro (4) None of these
- Q.16** $CH_3-\overset{\overset{O}{||}}{C}-NH_2 \xrightarrow[\Delta]{P_2O_5}$ Product will be - [RPMT-2005]
 (1) Ammonium acetate (2) Ammonia
 (3) Methyl amine (4) Methyl cyanide
- Q.17** Primary amine + $CHCl_3$ + KOH \longrightarrow product, here product will be - [AIEEE-2002]
 (1) Cyanide (2) Isocyanide

- (3) Amine (4) Alcohol

Q.18 Reaction of cyclohexanone with dimethylamine in the presence of catalytic amount of an acid forms a compound if water during the reaction is continuously removed. The compound formed is generally known as - [AIEEE-2005]

- (1) an enamine (2) a Schiff's base
(3) an amine (4) an imine

Q.19 In the chemical reaction,
 $C_2H_5NH_2 + CHCl_3 + 3KOH \rightarrow (A) + (B) + 3H_2O$,
 the compounds (A) and (B) are respectively -

[AIEEE-2007]

- (1) C_2H_5CN and $3KCl$
 (2) $CH_3CH_2CONH_2$ and $3KCl$
 (3) C_2H_5NC and K_2CO_3
 (4) C_2H_5NC and $3KCl$

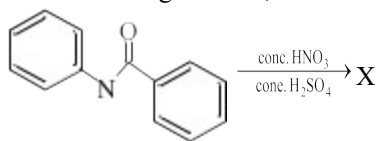
Q.20 $CH_3NH_2 + CHCl_3 \xrightarrow{KOH}$ Product, Product is

[IIT-2006]

- (1) $CH_3-N^+\equiv C^-$ (2) $CH_3-\ddot{N}^+\equiv C^-$
 (3) $CH_3-NH-CH_3$ (4) $CH_3-C\equiv N$

Q.21 In the following reaction,

[IIT - 2007]

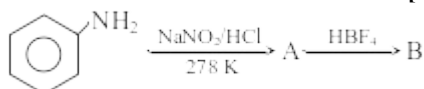


the structure of the major product 'X' is -

- (1)
- (2)
- (3)
- (4)

Q.22 In the chemical reaction

[IIT-2010]



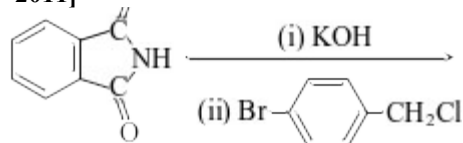
the compound A and B respectively are -

- (1) Nitrobenzene and chlorobenzene
 (2) Nitrobenzene and fluorene
 (3) phenol and benzene
 (4) benzene diazonium chloride and fluorene

Q.23 The major product of the following reaction is -

[IIT-

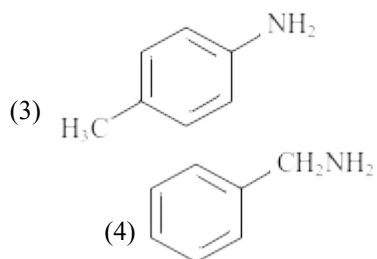
2011]



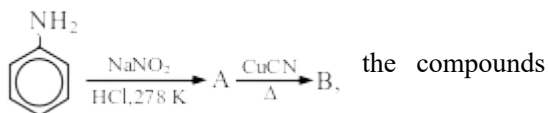
- (1)
- (2)
- (3)
- (4)

Q.24 Amongst the compounds given, the one that would form a brilliant colored dye on treatment with $NaNO_2$ in dill. HCl followed by addition to an alkaline solution of β -naphthol is [IIT-2011]

- (1)
- (2)



Q.25 In the chemical reactions



A and B respectively are -

[AIEEE-2011]

- (1) Benzene diazonium chloride and benzonitrile
- (2) Nitrobenzene and chlorobenzene
- (3) Phenol and bromobenzene
- (4) Fluorobenzene and phenol

Q.26 Biuret test is characteristic of compounds

containing the functional group - [RPMT-2011]

- (1) $>C=O$
- (2) $-NH_2$
- (3) $-CONH-$
- (4) $-C \equiv N$

Q.27 Benzene diazonium chloride on treatment with ethanol gives - [RPMT-2011]

- (1) Chlorobenzene
- (2) benzene
- (3) phenol
- (4) aniline

EXERCISE # 16

(ASSERTION & REASON TYPE QUESTIONS)

These questions of two statements each, printed as Assertion and Reason. While answering these Questions you are required to choose any one of the following four responses.

- (A) If both Assertion & Reason are true & the Reason is a correct explanation of the Assertion.
 (B) If both Assertion and Reason are true but Reason is not a correct explanation of the Assertion.
 (C) If Assertion is true and Reason is false.
 (D) If Assertion & Reason both are false.

Q.1 Assertion : Pyrrole is more basic than pyridine.

Reason : In pyrrole, nitrogen is sp^3 -hybridized.

- (1) A (2) B (3) C (4) D

Q.2 Assertion : Ethyl isopropyl amine is more basic than dimethyl amine.

Reason : More +I effect in case of dimethyl amine.

- (1) A (2) B (3) C (4) D

Q.3 Assertion : Boiling point of trimethyl amine is higher than that of n-propyl amine.

Reason : H-bonding is more extensive in tertiary amines.

- (1) A (2) B (3) C (4) D

Q.4 Assertion : $\begin{array}{c} \text{H}-\text{C}-\text{N}-\text{CH}_3 \\ \parallel \quad | \\ \text{O} \quad \text{CH}_3 \end{array}$ and $\begin{array}{c} \text{CH}_3-\text{C}-\text{NH}-\text{CH}_3 \\ \parallel \\ \text{O} \end{array}$ are metamers.

Reason : Both have same functional group.

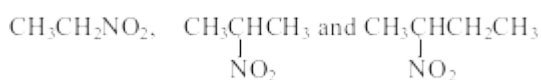
- (1) A (2) B (3) C (4) D

Q.5 Assertion : Aniline is a weaker base than benzyl amine.

Reason : In aniline, mesomeric interaction occurs between benzene ring and amino group.

- (1) A (2) B (3) C (4) D

Q.6 Assertion : The following compound are given below -



all three compounds are soluble in NaOH.

Reason : All above compound have lower boiling point than CH_3NO_2 .

- (1) A (2) B (3) C (4) D

Q.7 Assertion : Nitroalkanes and alkyl nitrites are functional isomers of each other.

Reason : Both alkyl nitrites and nitroalkanes give same hydrolytic products.

- (1) A (2) B (3) C (4) D

Q.8 Assertion : Acetonitrile is another name of ethane nitrile.

Reason : α -H atom of acetonitrile exhibit acidic character.

- (1) A (2) B (3) C (4) D

Q.9 Assertion : Pyrrole is a weaker base than its hydrogenated product pyrrolidine.

Reason : Lone pair of electrons on nitrogen are delocalized in pyrrole.

- (1) A (2) B (3) C (4) D

Q.10 Assertion : Benzonitrile is prepared by the reaction of chlorobenzene with potassium cyanide.

Reason : Cyanide ion is a strong nucleophile.

- (1) A (2) B (3) C (4) D

Q.11 Assertion : $\text{H}_2\text{N}-\text{C}_6\text{H}_4-\text{SO}_3\text{H}$ exists as a zwitter ion whereas $\text{H}_2\text{N}-\text{C}_6\text{H}_4-\text{COOH}$ does not.

Reason : $-\text{COOH}$ group being more acidic than $-\text{SO}_3\text{H}$ group so it can easily transfer a H^+ to the amino group.

(1) A (2) B (3) C (4) D

Q.12 Assertion : Oxidation of the nitro naphthalene gives phthalic acid.

Reason : An amino group attached to the benzene ring makes it resistant to oxidation whereas nitro group makes the benzene ring susceptible to oxidation.

(1) A (2) B (3) C (4) D

Q.13 Assertion : Ammonolysis of alkyl halides is not a suitable method for the preparation of pure primary amines.

Reason : Ammonolysis of alkyl halides yields mainly secondary amines.

(1) A (2) B (3) C (4) D

Q.14 Assertion : Carbylamine reaction involves chemical reaction between 1° amine and chloroform in basic medium.

Reason : In carbylamine reaction, $-\text{NH}_2$ group changes into $-\text{NC}$ group.

(1) A (2) B (3) C (4) D

Q.15 Assertion : The main product of reaction of alcoholic silver nitrite and ethyl bromide is nitroethane.

Reason : Silver nitrite is predominantly covalent compound.

(1) A (2) B (3) C (4) D

Q.16 Assertion : In strongly acidic solutions, aniline becomes more reactive towards electrophilic reagent

Reason : The amino group being completely protonated in strongly acidic solution, the lone pair of electrons on the nitrogen is no longer available for resonance.

(1) A (2) B (3) C (4) D

Q.17 Assertion : Aniline on reaction with NaNO_2/HCl at 0°C followed by coupling with β -naphthol gives a dark blue coloured precipitate. [IIT-2008]

Reason : The colour of the compound formed in the reaction of aniline with NaNO_2/HCl at 0°C followed by coupling with β -naphthol is due to the extended conjugation.

(1) A (2) B (3) C (4) D

Answer Key

EXERCISE-13

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	1	4	1	1	1	3	1	3	1	4	3	2	2	4	4	2	1	2	4	4
Q.No.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	4	2	4	3	1	1	2	1	2	4	1	1	4	1	4	3	4	3	3	4
Q.No.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	3	2	1	1	2	3	4	1	3	2	4	1	3	1	3	3	3	3	1	4

EXERCISE-14

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	4	2	3	4	3	2	3	3	3	1	1	2	3	2	4	1	4	1	1	3
Q.No.	21	22																		
Ans.	3	3																		

EXERCISE-15A

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Ans.	2	2	3	1	1	4	1	3	4	4	1	1	3	1	3	2	3	1

EXERCISE-15B

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	1	3	3	1	3	3	1	4	3	3	1	4	3	1	1	4	2	1	4	1
Q.No.	21	22	23	24	25	26	27													
Ans.	2	4	1	3	1	3	2													

EXERCISE-16

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Ans.	4	4	4	4	1	3	3	2	1	4	3	4	3	1	1	4	4

- Melting points are normally the highest for [AIIMS 2004]
 - Tertiary amides
 - Secondary amides
 - Primary amides
 - Amines
- Amines behave as [Karnataka (Med.) 1999]
 - Lewis acids
 - Lewis bases
 - Aprotic acids
 - Amphoteric compounds
- Which of the following compound gives dye test [MP PET/PMT 1998]
 - Aniline
 - Methylamine
 - Diphenylamine
 - Ethylamine
- In hydrolysis of aniline, the reagent used is [AFMC 1995]
 - Dil. HCl
 - Acetyl chloride
 - CH_3OH
 - None of these
- A nitrogen containing organic compound on heating with chloroform and alcoholic KOH , evolved very unpleasant smelling vapour. The compound could be [BHU 2002; BVP 2003]
 - N,N -dimethyl amine
 - Nitrobenzene
 - Aniline
 - Benzamide
- The reaction between a primary amine, chloroform and few drops of alcoholic KOH is known as [MNR 1987; MP PMT 1994; Bihar MEE 1996; AIIMS 1998; MP PET 2002]
 - Cannizzaro reaction
 - Carbylamine reaction
 - Wurtz's reaction
 - Reimer-Tiemann reaction
- Nitrolim is [BVP 2004]
 - $CaC_2 + N_2$
 - $CaCN_2 + C$
 - $Ca(CN)_2 + C$
 - $Ca(CN)_2 + NH_4CN$
- Phenyl isocyanides are prepared from which of the following reactions [CBSE PMT 1999]
 - Rosenmund's reaction
 - Carbylamine reaction
 - Reimer-Tiemann reaction
 - Wurtz reaction
- On strong heating, ammonium acetate gives [MNR 1995]
 - Acetamide
 - Methyl cyanide
 - Urea
 - Formamide
- Aniline is separated from a mixture by [UPSEAT 2000, 01]
 - Fractional crystallization
 - Fractional distillation
 - Vacuum distillation
 - Steam distillation
- Molecular formula of chloropicrin is [MH CET 2003]
 - $CHCl_3NO_2$
 - CCl_3NO_3
 - CCl_2NO_2
 - CCl_3NO_2
- In amines, the hybridisation state of N is [CPMT 1999]
 - sp
 - sp^2
 - sp^3
 - sp^2d
- Foul smelling compound formed, during carbyl amine reaction is : [Pb. CET 2001]
 - Alcohol

- (b) Aldehyde
- (c) Alkyl isocyanide
- (d) Carboxylic acid

14. The end product of the reaction

[Kerala PMT 2004]

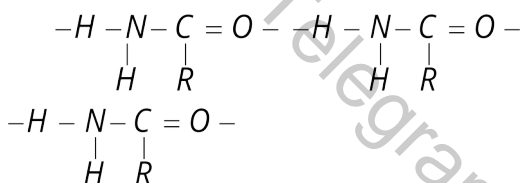


- (a) Ethyl amine
- (b) Diethyl amine
- (c) Propane nitrite
- (d) Triethyl amine
- (e) Methyl amine

AS Answers and Solutions

(SET -29)

1. (c) The higher boiling points of amide is because of Intermolecular hydrogen bonding

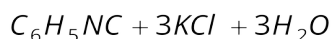
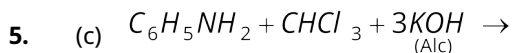


Due to intermolecular hydrogen bonding they have high boiling point than amine and amongst amide the order of Boiling point are

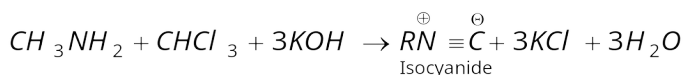
Primary > Sec > Tertiary

This is because of alkyl group by which the carbonyl oxygen do not form the hydrogen bond (other molecule) so primary amide have high boiling point and Tertiary amides does not have to form bond with O of other amide and have least B.P

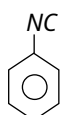
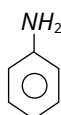
2. (b) In amines nitrogen has a lone pair of e^- . It can donate a lone pair. So amines behave as a Lewis base.
3. (a) Basically all the Azo dye are derivatives of aniline.
4. (a) All amines react with mineral acids such as HCl , H_2SO_4 , HNO_3 etc. to form salts which are soluble in water.



6. (b)



7. (b) Nitrobenzene is a mixture of calcium cyanamide and carbon.

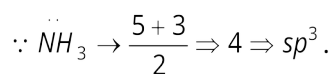


Carbyl amine reaction.

9. (b)

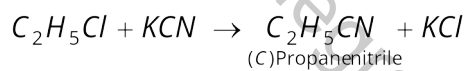
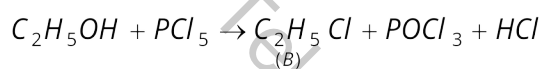
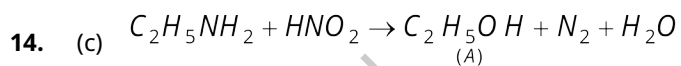
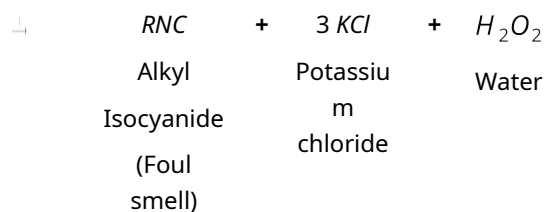
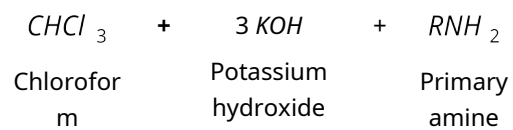


10. (d) Steam distillation is used for separation of aniline from mixture. Aniline is insoluble in water but it is steam soluble.
11. (d) Molecular formula of chloropicrin is CCl_3NO_2
12. (c) It is similar that of NH_3 except H- is replaced by -R group.



13. (c) On heating CHCl_3 with ethanolic KOH and primary amine, isocyanide is formed and is readily

detected by its offensive odour. This is called as carbyl amine test.



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